Grinding and Finishing

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The Magazine Devoted Exclusively to Abrasive Operations

DEC 1 1955

★ FEATURES

Selecting the Right Tool For Portable Grinding

Two Chucks Simplify Grinding of Odd-Shaped Parts

Five Types of Abrasive Belt Machines

Oscillating Grinding Values Established With Standard Data

ALSO IN THIS ISSUE

Tool and Cutter Grinding Department

Safety Department

Pages From the Notebook

Shop Hints and Kinks

June 1955

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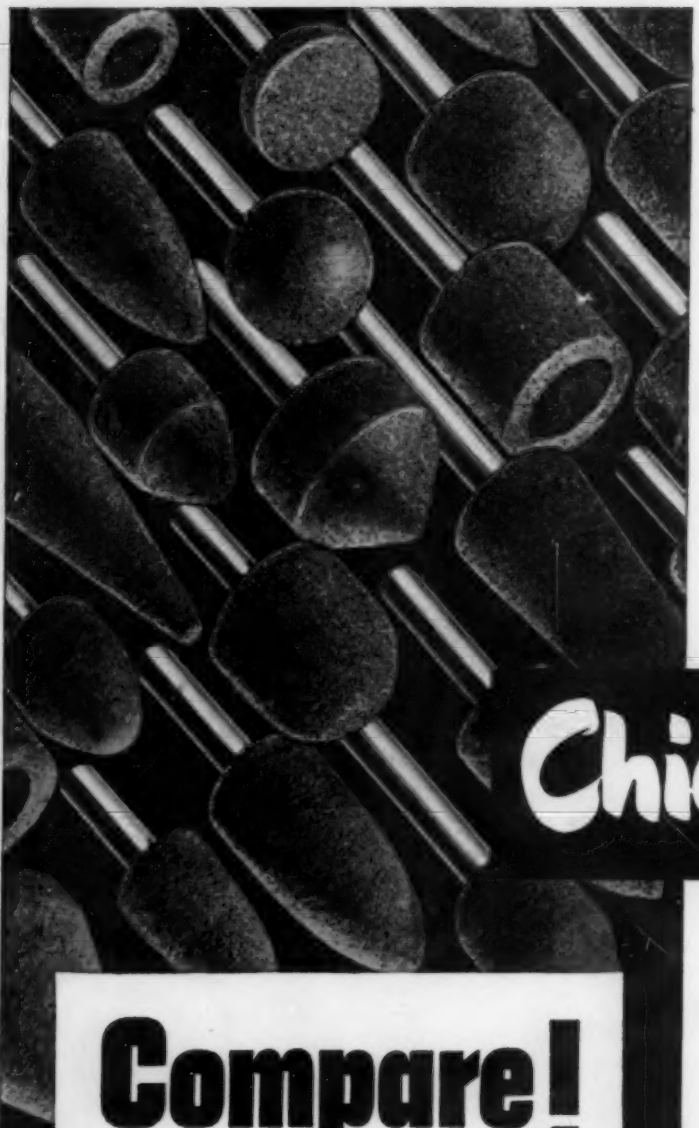

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JUL -8 1955

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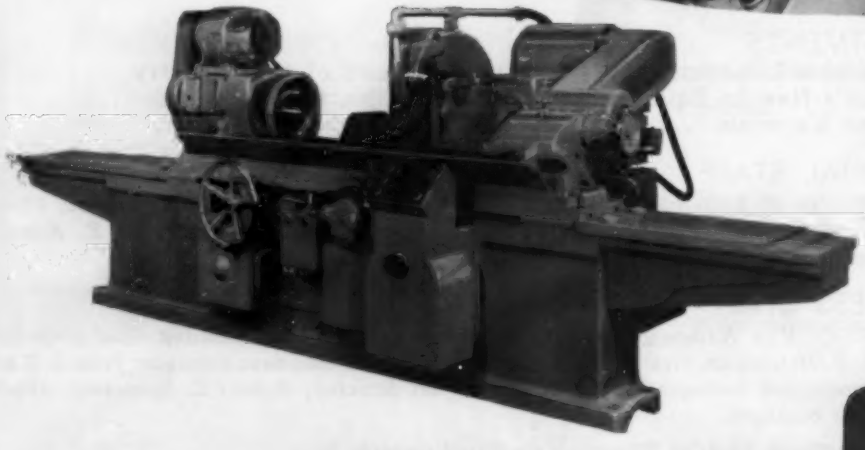
Adds the final touch of quality to



HardClad* radial drill columns are ground to a high degree of accuracy and finish on this CINCINNATI FILMATIC 18" x 72" Plain Grinding Machine.

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Plain Grinder

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FILMATIC grinding wheel spindle bearings ... outlast the machine; never require adjustment

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Many additional features of high-quality, low-cost performance. Write for more information.

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*Note: HardClad is the trade name for the Cincinnati Lathe and Tool Co.'s flame hardened radial drill column.

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for lapping and grinding

(not an index table)

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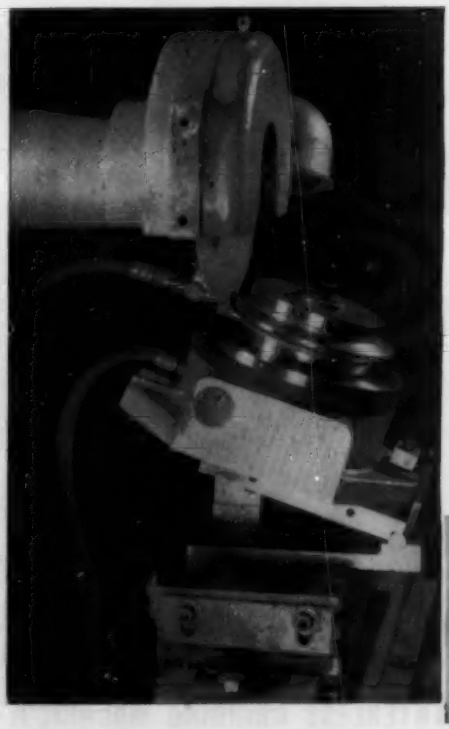

Work clamped to motorized table, mounted on sine plate. Surface grinder application.

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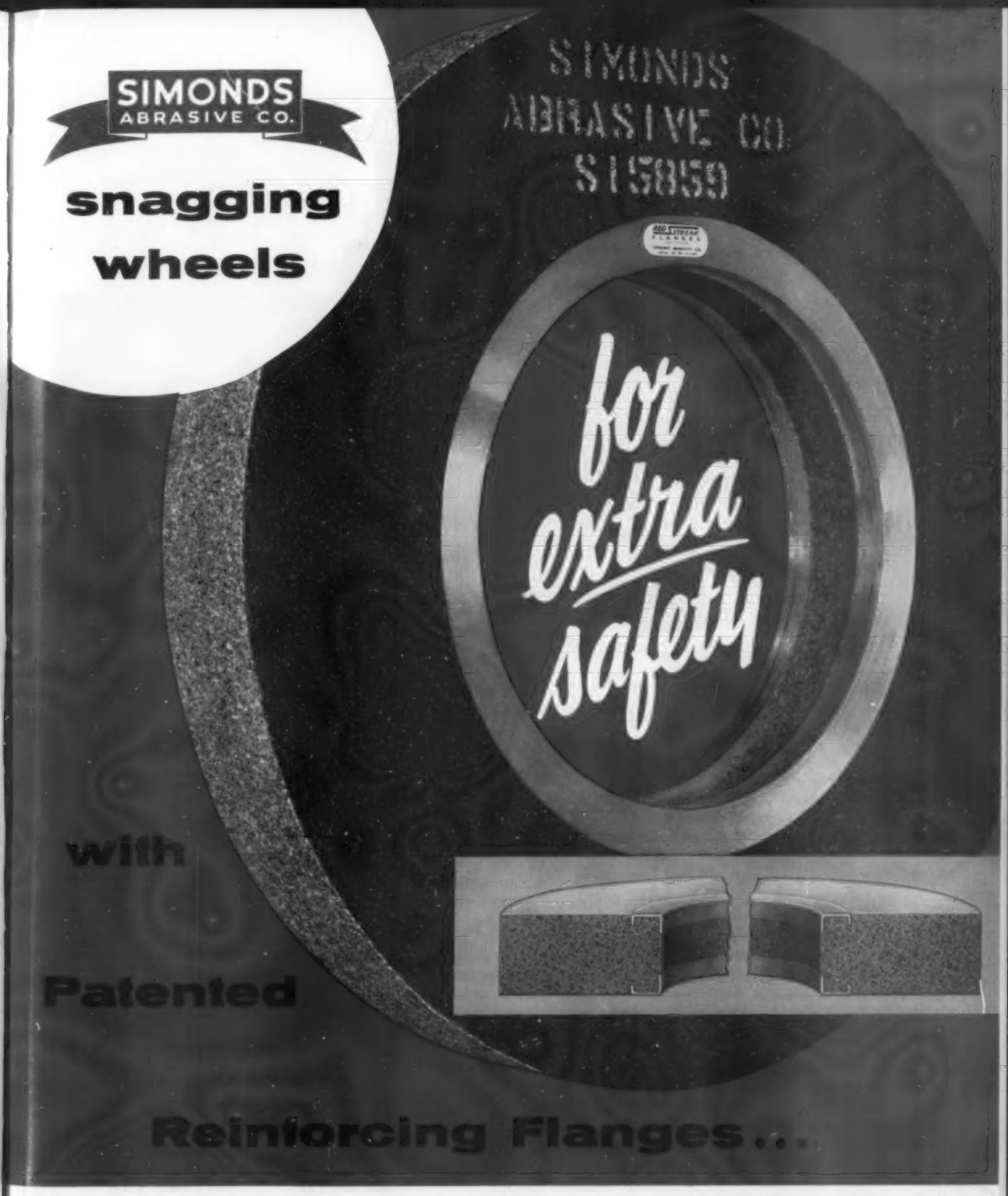
snagging wheels



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NEW

LOW PRICED AUTOMATIC SURFACE GRINDER

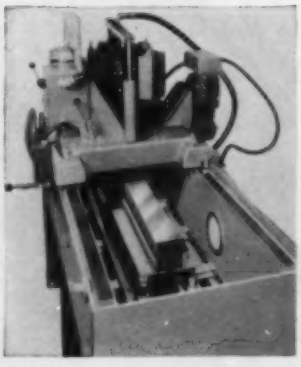
THE *Grindmatic* by LEMPCO

In introducing the Grindmatic, Lempco is actually introducing a new way to make a double reduction in grinding costs.

1. The Grindmatic means a low investment cost . . . *your first savings!*
2. The Grindmatic brings lower production costs . . . *savings that multiply with use.*

The Grindmatic represents the highest value ever offered for your grinding dollar. Designed specifically for industrial grinding applications, it combines fast set up and automatic traverse. Quick feed and positive control of the grinding wheel speeds up operation. Designed for use with conventional holding fixtures or a magnetic chuck offered as optional equipment. Bed arrangement permits inspection for finish and accuracy without removing the work from the machine. This combination of features reduces handling and cuts grinding time per piece.

If obsolete or low production grinding equipment is robbing you of profit, let Lempco demonstrate the savings you can make with this new, low-priced grinder.



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Vertical spindle grinding wheel is counterbalanced by pneumatic cylinders which permits effortless movement. Coolant is supplied from a 50 gallon tank located in the bed of the machine. All controls are grouped for convenient operation.

SPECIFICATIONS:

- Grinding Wheel Speed — 1140 RPM
- Wheel Diameter — 12"
- Work Capacity — 38" long, 11½" wide, max. height 11"
- Bed dimensions — 71" long x 20" wide
- Overall height 65", depth 39", length 74"
- Wheel Motor — 3 h.p.
- Feed Motor — ½ h.p.

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The Editor's Page

There is something wondrous and soul-satisfying about technological advancement and scientific progress. As quickly as one manufacturer says, "I can now do so-and-so," everyone clamors to take advantage of the development. We're thinking primarily in terms of dimensional tolerances and surface finishes.

When it became known, years ago, that some machine tools were holding accuracy to one thousandths designers and engineers specified everything to this new dimension. And with splendid results. The same thing occurred when one ten thousandth no longer held terrors for the manufacturer.

Now designers and engineers have discovered the microinch!

Hah, here's a wondrous world of millionths! Fantastic what the abrasive industry can do; simply phenomenal. Let's design something in millionths.

And they do; everything from projectiles to gas pipes that are buried in the ground is specified to 1 microinch. No manufacturer has an objection to working to close tolerances, providing someone will pay the cost, but it does seem a bit silly, sometimes, to work to 1 microinch when there's no need for it.

We spent some time recently with a manufacturer who had an ordnance order for cams with a surface specification of 30 microinches on the sides of the cam; the edges, which needed it, were not specified at all. The cam was a pretty expensive item to produce, requiring lapping on two sides.

We've seen prints for projectiles, which at best, would find an explosive demise, specifying surface finishes of 40 microinches on the base. Remembering our own experiences with anti-tank shot production during the war, we continue to shake our head over a great waste of time and effort.

If designers would use caution and discretion and indicate an exact finish where it's absolutely required considerable money could be saved. The irreverent specifying of microinch dimensions is ridiculous and unnecessary. To be sure, the abrasive industry can do it neatly, but no one likes to spend a lot of time over an unnecessary job.

Remember to figure the cost: if 2000 microinches has a cost rating of 1 then a Fine finish (63 microinches) has a cost rating of 13; a Ground finish (16 microinches), a rating of 25; Polish (8 microinches), a rating of 35; and Super Finish (4 microinches), a rating of 40. It becomes evident that there is a point of diminishing returns if surface finishes are specified indiscriminately. Specify them by all means, if needed, but don't do it for the fun of it. It becomes costly.

William F. Schleicher

". . . once the analysis is conducted and the savings realized, the savings repeat themselves after the tool is paid for so long as there is no change in the work, or unless a better tool comes along.

". . . the cash amounts involved to realize the savings by purchase of portable tools are relatively small.

". . . tools will pay for themselves under average conditions in from four to twenty-six weeks.

". . . under today's pressure on cost, considering the relatively small amount of dollars involved, these savings become worthwhile."

Selecting the Right Tool for Portable Grinding

By **James H. Amick,** Application Engineer
Rotor Tool Company
Cleveland, Ohio

THIS ARTICLE discusses the problems of selecting the right tool and the right accessory for portable grinding problems, such work as snagging castings, cleaning welds, finishing surfaces, etc. These portable tool operations are expensive, since an employee costs $1.50 to $2.00 an hour without any consideration of overhead or fringe benefits. If we assume the individual is grinding only half of the working day, the direct labor cost of the individual operator is:

½ time x 40 hours per week, x 50 weeks a year x $1.80 an hour
$1800.00 a year as the minimum.

The effectiveness of the individual, of course, is dependent upon the efficiency of the portable tool and accessory. Often too, the quality is dependent upon the tool setup, particularly in finish grinding.

In approaching these problems in the average shop, the factory executive usually takes stock and considers what tools and accessories he has available to do the different job, figure 1.

Next consideration is given to the cutting accessories available for the tools, figure 2. This covers small mounted points, small grinding wheels, 1″, 2″ or 3″ in diameter, 4″, 6″ and 8″ straight wheels, various types of cup wheels, sanding pads, edge wheels, buffing wheels, etc. This section is by no means complete as the number of accessories available is very large, and is constantly growing.

In approaching the problem, the factory executive also will turn to the American Safety Code because it is obvious that recommendations of speeds and accessories must comply exactly and completely with the Safety Code. The recommendations of the Code, in general, are in surface feet per minute—translated into rpm's for different size wheels. Attention must be given to the mountings of the wheels, the guards, and in the case of small points, to the size and extensions of the shanks.

The study of portable grinding problems may be made by a number of different types of executives. In some cases, the foreman undertakes the project, or it may be a project or process engineer, or in large companies, a portable tool application engineer. In any event, the analysis will proceed logically through a five step study.

1. The tools and accessories available will be listed in complete form, figures 1 and 2.
2. The best accessory to do the job will be selected, bearing in mind, not only the speed of the accessory, but the finish developed by the cutting unit.
3. Then, the proper speed and power will be determined and matched up with the available portable tools.
4. Then, the proposed tool and accessory is tried out. This may involve getting a trial of a tool from a manufacturer, or it may involve buying the accessory, putting on a tool already available.
5. As the tool is tried out, either time study or production figures are taken to determine the savings, and some form, similar to the "Time to Repay" form is used to find out how long it will take for the tool to pay for itself.

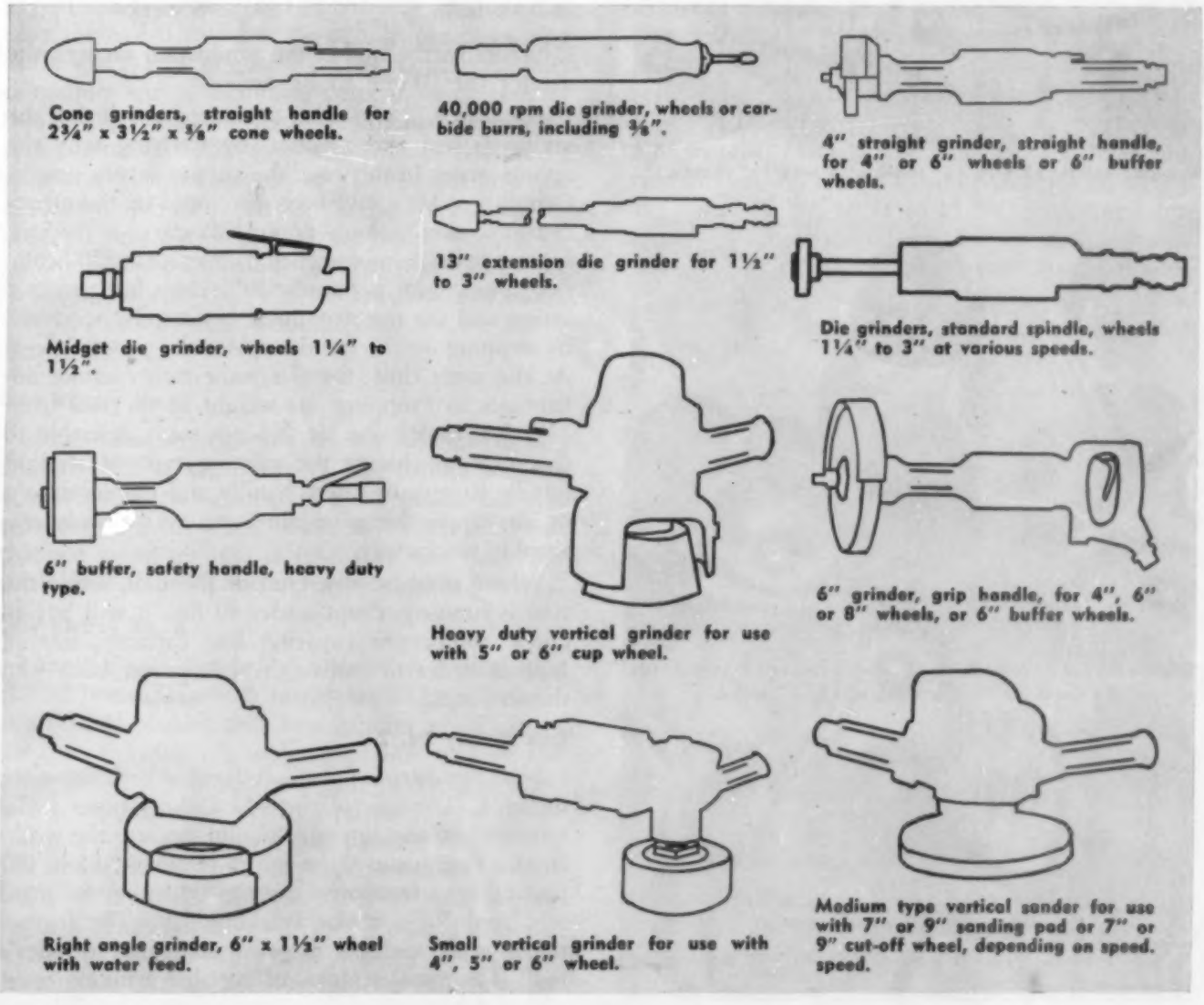
Portable tools in general, are an expense item: the units of capital involved are small, $100.00, $200.00 and sometimes $300.00, so that improvements should pay for themselves in from 4 to 26 weeks, in general. Cases will arise where the improvement is so remarkable that the actual payoff period may be less than this, or, in some cases, where existing tools are already practically worn out, the standard set for the purchase of new equipment may extend beyond 26 weeks, in the experience of some users.

However, the use of a standard "Time to Repay" will encourage factory executives to analyze their problems, will define the range in which they are allowed to operate and will convince top management of the desirability of a constant program of improvement.

Case History No. 1

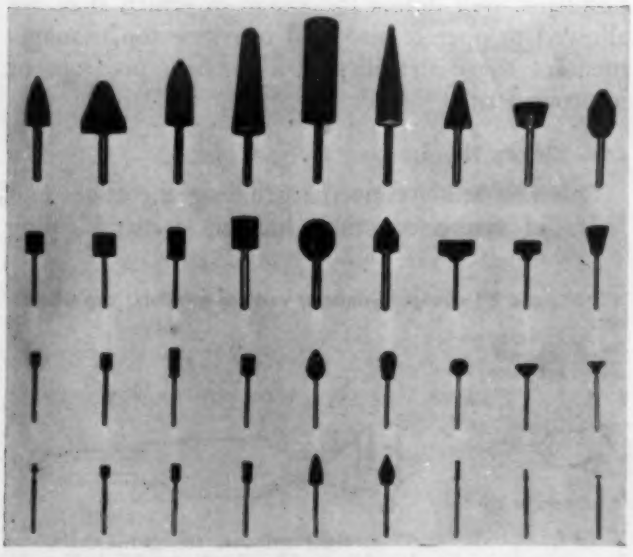
Our first study concerns grinding the edges and holes of flame cut tube hangers with 4" plug

1. Portable abrasive tools available from a number of manufacturers in the field. These common types include: small high speed grinders; midget grinders for small wheels; core grinders; 4", 6", and 8" straight grinders; vertical grinders; cup wheels; etc.

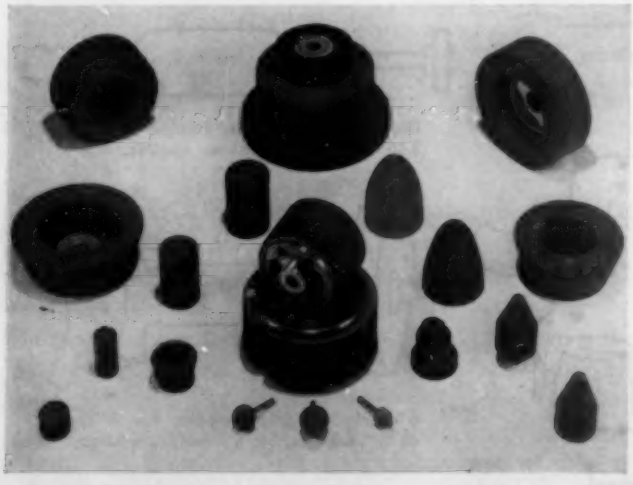

Cone grinders, straight handle for 2¾" x 3½" x ⅝" cone wheels.
40,000 rpm die grinder, wheels or carbide burrs, including ⅜".
4" straight grinder, straight handle, for 4" or 6" wheels or 6" buffer wheels.
13" extension die grinder for 1½" to 3" wheels.
Midget die grinder, wheels 1¼" to 1½".
Die grinders, standard spindle, wheels 1¼" to 3" at various speeds.
6" buffer, safety handle, heavy duty type.
Heavy duty vertical grinder for use with 5" or 6" cup wheel.
6" grinder, grip handle, for 4", 6" or 8" wheels, or 6" buffer wheels.
Right angle grinder, 6" x 1½" wheel with water feed.
Small vertical grinder for use with 4", 5" or 6" wheel.
Medium type vertical sander for use with 7" or 9" sanding pad or 7" or 9" cut-off wheel, depending on speed. speed.

wheels. The existing method was an 8″ grinder operating at 4100 rpm, a powerful machine, in good condition, but the correct speed for the 4″ high speed wheel, as shown by the Safety Code, is 8500 rpm. In this case, it was a simple matter to put on the job a lighter machine of the 4″ high speed straight grinder type, operating at 8500 rpm. The time required per unit was developed by checking pieces per day and expressed in terms of present time 9-1/2 minutes, new time 3-1/3 minutes. Our experience has been that the most effective way to analyze this type of situation is to translate the figures into percentage showing the savings in time. In this case, the figure is 64%.

2. Commonly used forms and sizes of cutting accessories used in portable grinding operations.



Mounted points: 12 with ¼″ shanks, 24 with ⅛″ shanks.



Grinding wheels, showing cone wheels, mounted points, cup wheels and Quick-As-Wink buffing wheels 4″ and 6″.

Various makes of cut-off wheels, 7″ and 9″, showing nut and adapter.

The convenient way to determine the time required for the tool to pay for itself is to use a simple "Time to Repay" statement shown in figure 3. This shows the percentage of savings in time, and the application engineer will immediately consider how much of the time the tool is used, as obviously the tool is not saving 64% of an 8 hour working day. In this case, a general study of the situation showed about 60% of use. Figure 3 shows, in this case, it took 6½ weeks to repay the cost of the new tool. This "Time to Repay" will vary with different production savings as shown in the table below—assuming a factor of use of 50% and a tool cost of $200.00.

% Production Saving	"Time to Repay" in Wks.
20%	25 weeks
30%	16½ weeks
40%	13 weeks
50%	10 weeks
60%	6 weeks

Naturally, the higher the production savings, the shorter the "Time to Repay."

The user will also want to assure himself that the saving is real and practical by studying why the saving arose. In this case, the answer is very simple. Grinding wheels have been developed by the manufacturers over a long period of years. 4″ wheel, high speed type, is designed to operate at 8500 rpm, free speed, with perhaps a 10% drop for governor action and the metal removal is naturally increased by stepping up the speed to twice the present speed. At the same time, there is some rather minor advantages in dropping the weight of the tool from 11½ lbs. to 8¼ lbs. It did not seem desirable to this user to change the existing type of straight handle to grip or safety handle and the conditions of air supply, hose, pressure, etc. was already reasonably satisfactory.

Where pressure delivered at the tool, while the tool is running, drops under 80 lbs., it will pay to check compressor capacity, line capacity, size of hose in order to realize the full power built into the tool itself.

Case History No. 2

Next we turn to a 6″ straight wheel situation, figure 4. The size of the wheel many times is determined by the necessary size to get into the work. In this case history, the job is removing flash and parting lines from steel castings with the tool actually used 50% of the working day. The former tool was old and low in power compared to today's tool. The metal removal of portable grinding oper-

3. Estimating "Time to Repay."

Present Tool A @ 4100 rpm.	Time Required Per Unit	9-1/2 Minutes
New Tool B @ 8500 rpm.	Time Required Per Unit	3-1/3 Minutes
	Savings	6-1/6 Minutes
	Divide Savings by Present Time =	64% Saving
	How Much of Time is Tool Used?	60% Use
	Price of New Tool $200.00	$200.00
64% Savings x 60% Use x $2.00 Hourly Rate x 40 Hrs. Per Week		$30.72
6½ Weeks to Repay the Cost of New Tool		

ations depends on the power of the tool under load, applied at the correct speed for the cutting accessory. The time saving in this case was 50%, which is probably higher than most of these situations.

Such high savings are not necessary to fully justify "Time to Repay," and of course, is obvious that after the tool is paid for, the savings persist as long as the tool is kept in good working condition. Many companies use a minimum percentage of production saving, assuming that the time in use is some such figure as 50% and will change equipment whenever the percentage of saving is above the minimum without further accounting complications. It may be added that the dollar amount involved in the new machine in turn affects the "Time to Repay" but in the field we are now discussing, this will usually run about $200.00, for the heavy duty work.

Case History No. 3

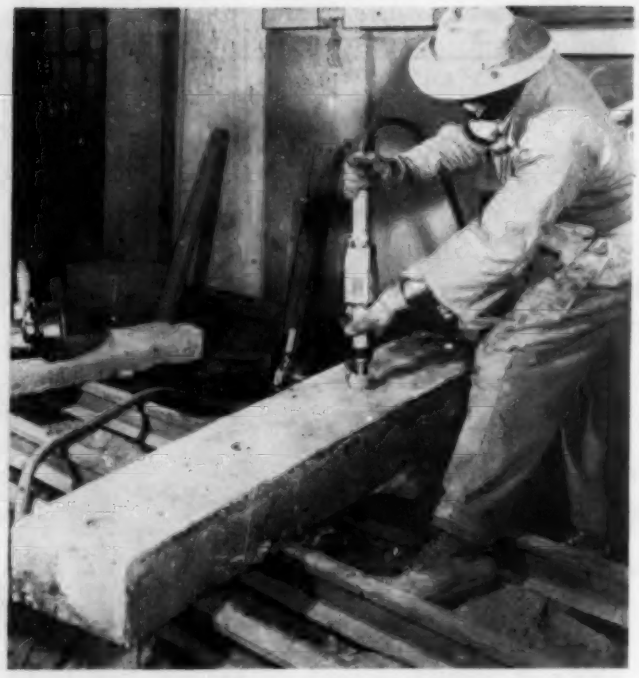
Here's another example of the change to the proper wheel speed, figure 5. The former method used is an electric grinder of the 3 phase, 220 volt type, with 2¾"x3½"x⅝" cone, 3600 rpm. This was changed to an air tool at 8500 rpm and time was cut in half. The "Time to Repay" was 11.7 weeks.

Case History No. 4

Here the user changed to a so-called vertical type of tool, something of a misnomer. The spindle is in a vertical position with two handles at 120° apart for control, with the tool tipped one way or the other to work pretty largely on the outside edge. In this case, an edge wheel, a relatively new development, was used. The former method employed a tool which did not have the proper speed and power. The new method employed a 6¾ lb. tool, operating at a conservative speed of 4500 rpm. The type of finish obtained with these wheels, tends to be flat and better than with straight wheels. In using the vertical type of tools, the Safety Code must again be consulted, making sure that the flange and spindle of the tool is proper for the type of wheel mounted and making sure that the wheel is properly guarded.

The new method in this case history cut production time 28%, and paid for the tool in 13½ weeks. In addition, it gave a better finish. Over the years the vertical type of grinder has displaced a large part of the field formerly using 4", 6" and 8" straight side wheels. Manufacturers of portable tools provide this vertical tool in basically three types, weighing 7 lbs., 10 lbs., or 11 to 13 lbs., with speed correct under the Safety Code for the different cup wheels. In selecting from these three types it should be remembered that power is necessary for performance, and the correct power and speed should be

4. Removing flash and parting lines from steel castings.



5. Previous method ran the tool at 3600 rpm. With a change to 8500 rpm production time was cut in half.

given first consideration, even though the weight may be somewhat greater. Operators, of course, prefer as light a tool as possible, and the weights of practically all air powered portable tools have been cut substantially in recent years.

Case History No. 5

Another illustration in the grinding field is selected to show the advantages of the very small, high speed, high powered type of grinder. This covers a tool weighing 13 ounces, running 40,000 rpm of the internal blade type with plenty of power, and replaced a larger and heavier tool of the small wheel type, grind-welds smooth on stainless steel condenser tubes. Small mounted points were used, grinding time was cut from 15 minutes to 7 minutes and production saving of 46.5%, which paid for the grinder in 3½ weeks. It was also noticed that the mounted points lasted twice as long, since the speed was proper for these points. There are a great many of these small, high speed grinders in use, unfortunately, which do not have sufficient actual speed or power to do the job. The name plate may read a very high rpm, but once the tool is put under load, the speed drops down to a very low rpm, which is too low for proper cutting action, or proper wear of the grinding points.

Often trouble is encountered in this field by vibration, or wobbling of the point itself. In analyzing this type of work, the first step is to determine the correct cutting accessory which will reach in, and do the job fast. This may involve some trial with different points, as the wear on some grades and grits of these small mounted points is likely to be excessive. In this case, a mounted point ⅜" in diameter, ½" long with a ⅛" shank was used, held in a collet and bushing. Reference to the American Safety Code B7.1-1947 (about to be revised) showed that particular care must be given to determine accurately the amount of overhang between the end of the collet and the back surface of the point which proved to be 1". This would have permitted a maximum speed of 23,800.

Further checking developed that a 1" overhang was not necessary and this was reduced to ½" which gave a safe operating speed of 38,250 rpm. In this type of operation it was also necessary to check the clearances of the front end of the tool to be sure that the front end of the tool itself could get into the job and turn the mounted point. There is also some study usually in this sort of a situation on the exact type of throttle or handle to be used, generally going to the straight type of tool. Regardless of time savings, the reduction in use of mounted points to one half of those formerly used, in itself paid for the tool in a relatively short space of time in addition to the production time savings. The economic figuring of portable tool savings often gets a bit involved, if it is done thoroughly. It has been our experience, that in general, confining the figuring to the actual time saved is, in itself, sufficient to justify portable tooling changes in view of the low unit price of the new tool itself.

This article has endeavored to show in rather condensed form, the general line of approach to portable grinding problems. It is the experience of all of us working in this field that a great many opportunities are present for reducing costs from 20 to 50% by portable tool analyses of this sort. ● ●

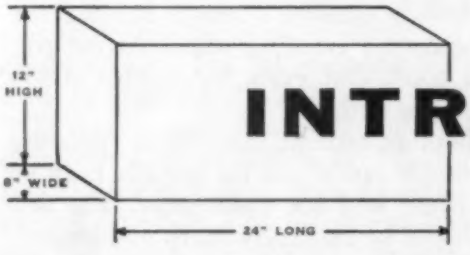
6. Approved types of adjustable guards ordinarily used with 6" cup wheels, and other guards approved by the Safety Code.

New revolving cup guard for 6" cup wheel.

Usual adjustable guard for 6" cup wheel.

Special guard for 9" edge type of wheel.

9" sanding pad is usually used without guard.



INTRODUCING... THE No. 824

Hydrabrasive super-performance now available in 8″ x 24″ capacity—for surface grinding jobs requiring long table length and moderate cross travel.

ABRASIVE
ACCURACY BOOSTS PRODUCTION

ABRASIVE MACHINE TOOL CO.
36 Dunellen Road East Providence 14, R. I.

Send for facts and figures!

Send complete details on the new Hydrabrasive No. 824 Surface Grinder.

Name.....

Company.....

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.....

.....

Encircle No. 205 on card opposite Page 68

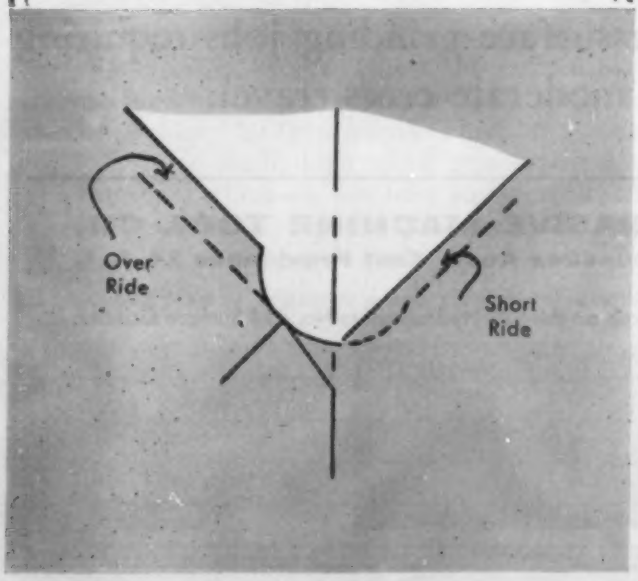
By **Henry F. Swenson,** President
J & S Tool Company, Inc.
Livingston, N.J.

What Is the Smallest Radius That Can Be Dressed With a Wheel Dresser?

Other Interesting Questions Answered by the Author

- dressing a .003-in convex radius at 180°
- forming a .010-in. concave radius at 90°
- errors with nonconcentric diamonds
- what grit and hardness wheel is best for forming a convex radius
- what effect does diameter have on hardness of grinding wheel

Sketch 1



THE ANSWER is quite simple and is best explained as follows:

First, when dressing a small concave radius, the limitation is in the diamond point. Secondly, in forming a small convex radius the grinding wheel is the limiting factor. Third, the rigidity of the dresser must be positive and chatterless, also the infeed cannot exceed .0002 in. in a sweep. Most important, therefore, in dressing a convex radius is the selection of the correct grinding wheel. A fine grit, medium hard bond, (for example, number 400-J) of wheel will dress well.

Let's talk about an extreme case. We are dressing the smallest possible radius and the grit size must be small so the wheel will not disintegrate. The diamond point should be extremely sharp and concentric. The concentricity of the diamond point in this case is very important, as we can see in sketch number 1. However, on a sharp diamond point we can expect wear and an allowance should be made by advancing the diamond a fraction.

It is almost impossible to dress a .003 in. convex radius at 180°, even with the sharpest diamond and the best selected grinding wheel. However, this can be a problem that you may overcome if a .003 in. radius at a 165° angle can be substituted. Sketch number 2 indicates what we mean and shows that the accumulated error from the two sides of concave parts thus ground and fitted together amount to only 1/10th of a thousandth.

When a knife edge section results from the 7½° side angle, this knife edge can be straightened in the following manner. The error due to the flaring from the side angle is slight in 180° and on a small radius of .003 in. it amounts to less than .0001 in. In other words you would have an "out of round" condition in the hole of split die of a total of .0001 in.

A .010 in. concave radius at 90° can be formed providing a sharp pointed diamond with an included angle of not more than 60° is used. This is demonstrated by sketch number 3. You will note an interference develops as the diamond point wears, which is the limiting factor.

A radius tangent to an angle can only be dressed when the angle on the form is greater than and will clear, the angle on the diamond, see sketch number 4.

The concentricity of the diamond is very important when working with small radii. For example, a diamond of .010 in., that is eccentric when used for forming a .010 in. radius can place the diamond point as far as 45° off the centerline, see sketch number 5. The result is approximately a .013 in. radius, due to the error in the diamond point.

A most serious error can appear when a nonconcentric diamond is used in dressing a small radius tangent to an angle because the diamond point will over-ride, causing what appears as a dip at the tangency on one side, on the other side a short ride, which in this extreme case steals the whole radius on the right side of the form, see sketch number 1.

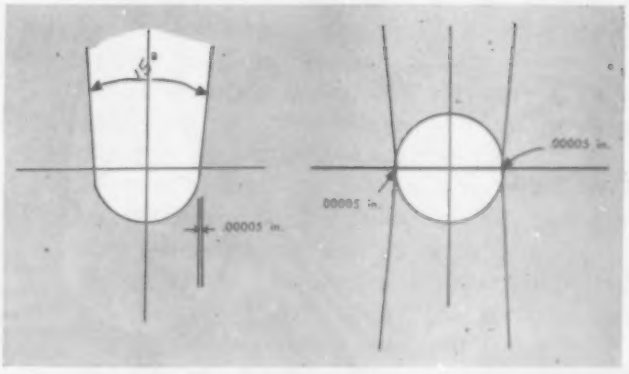
The error produced by a nonconcentric diamond is in direct relation to the size of the radius being dressed. (On a 2 in. radius a .005 in. error would not develop a noticeable error at the tangency.)

A nonconcentric diamond can be used however, by placing a diamond on a comparator and rotating it until you find the centerline. Then you mark the shank so that the diamond point is in a vertical position to the centerline of the shank and use it in that exact position. The off-centerline diamond is indicated by sketch number 6.

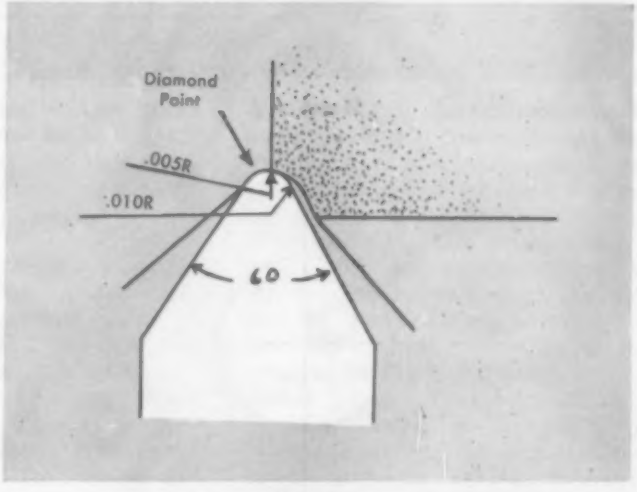
To dress a small concave radius at 180° it is found that .040 in. is the low limit. The form should be roughed out by a dull diamond point which has first been checked on a comparator to know how deep you can rough the groove. Extreme care must be used in finish dressing a small radius like this because of the slender bottle shaped diamond holder that you are compelled to use, see figure 7.

But for example if a .020 in. radius has to be ground at 180° we suggest that the wheel be dressed at 90° concave and the form ground by turning the work back and forth, that is, swinging the work at 180°. This will also give us control over the positioning of a given 180° radius. It is also a safer method.

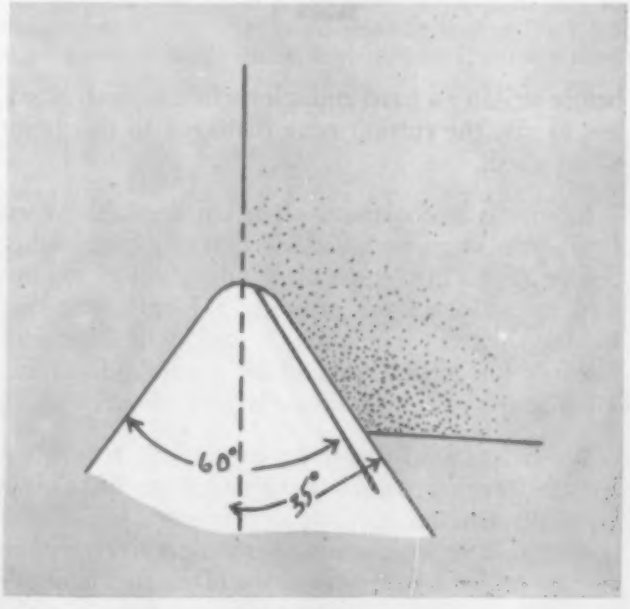
When a concave radius smaller than .040 in. at 180° has to be formed, "form crushing" is the best way out. A hand cranked crusher can be quickly made by taking a block of steel 2" x 2" x 3" and boring it lengthwise. Insert a shaft with a shoulder and a collar to eliminate side play in the manner of the sketch number 8. You will find that crushing works best on a coarse open grit grinding wheel and will give longer life to the crusher which for a smaller radius does not necessarily have to be serrated.



Sketch 2

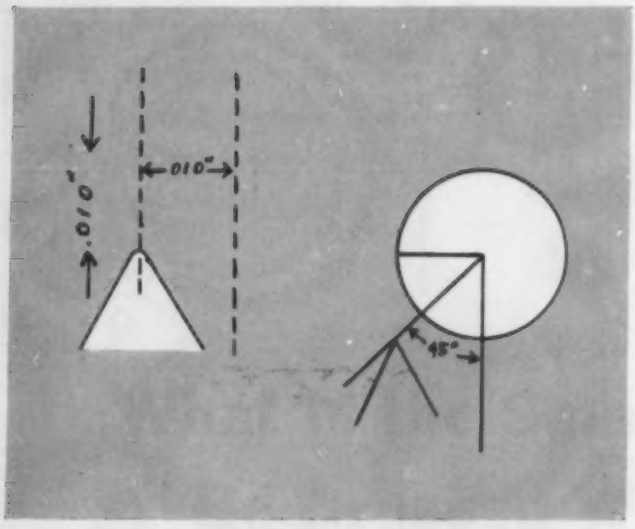


Sketch 3

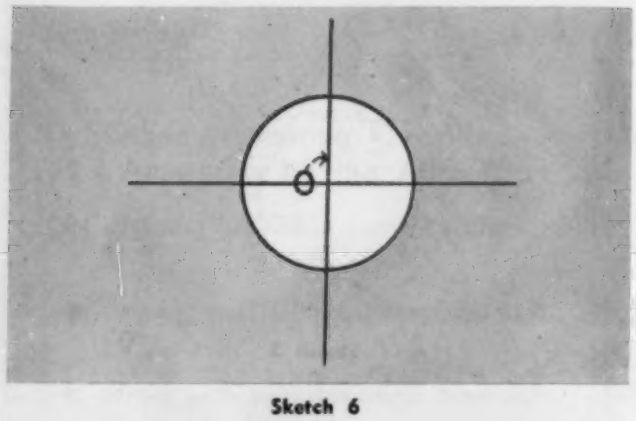


Sketch 4

In form grinding there is a definite tendency for the less experienced operator to select a "too hard" grinding wheel, overlooking the fact that a hard wheel will very quickly load and dull causing burning of work. This should be guarded against because the edge of a high speed steel tool is readily overheated to a point where a file will cut a .002 in. depth.



Sketch 5



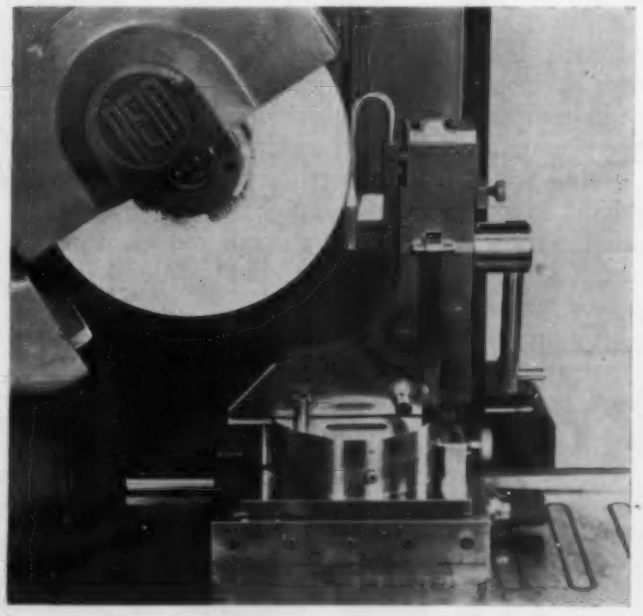
Sketch 6

before striking a hard enough surface to skid. Needless to say, the cutting edge damaged to this point is not good.

Inasmuch as coolant is often objectionable when finish grinding a tool, the selection of a cool cutting coarse, "open grit" type of grinding wheel is most important. In surface grinding a J or K standard hardness wheel (depending on steel) will serve satisfactorily for general use and for general adaptation. (A fine grit will not necessarily give a better finish.)

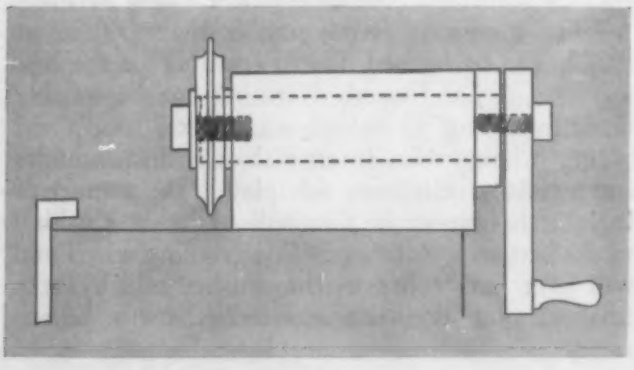
We have found this to be particularly true when we are working with unhardened material. This is especially true on stainless steel when a high finish is required. If we examine a stainless steel ground surface under a microscope, we often find that the chips have imbedded themselves and appear in the microscope as a short streak and the imbedded chips roll up in what looks like a pimple. This problem can be quite difficult to overcome. For instance, I recall a stainless steel valve plug that we required to hold better than 10 Micro finish, we finally ended up using A 32A60—K 12 V (porous) wheel. (You'll recognize this as a soft wheel for cylindrical grinding.) After careful dressing we took a stiff brush and brushed the loose grit out and we even used an air hose against the periphery of the wheel to make sure all the loose grit was dislodged. After that we held a cake of bees wax against the wheel. The bees wax lubricated the grinding wheel and it helped hold the grits bound together and cut down the grinding action and gave a better polish.

In toolroom, and wherever we have to work any type of material that comes along, the selection of the grinding wheel is not the only factor that we must consider; for instance, if a given grinding wheel 6¼ in. dia. is doing a good job we can expect variations in performance at 5½ in. or full 7 in. dia. wheel. In other words, the surface feet per minute is a governing factor, the higher surface speed will make the grinding wheel act harder, and with lower speed; it will act softer. Another instance that makes a grinding wheel act harder or softer is the diameter of the workpiece. If, for instance, a P hardness grinding wheel works well on a ½ in. dia. the same material 5 in. dia. would call for as much as 2 grades softer, due to the contact point being different. We could maintain work speed coolant variation if hard-



7. Wheel dresser shown with 180° attachment for dressing 180° concave radii.

Sketch 8



ness is an added factor to take in account. Should we multiply the above variations 100,000 times, which would represent variations possible in a grinding wheel, we find grinding an imposing technique and skill.

Some of the ways in which you can get utmost precision and save considerably in the cost of accomplishing the dressing of your grinding wheels is by using the standard types of wheel dressers. The types of dressers indicated in this article provide:

1. Convenience and ease in dressing angles as well as providing a means of getting utmost precision.
2. Permits the combination of radius and angle dressing at one setting.
3. Provides a single tool to use for accomplishing all of your dressing and only a micrometer is needed for even the most precise settings.
4. With the wheel dresser it is very easy to check the radius. Just back the dresser away from the wheel and check it simply with a micrometer.
5. Permits you to check diameters which wear quickly without removing from the machine. Also, this does not necessitate another setting.
6. By use of the micrometer it is quickly possible to check the in-feed of the dresser that serves to measure the depth of radii you are dressing.
7. Definite precision results are predetermined in all of your wheel dressing. ● ●

World's Biggest Vertical Spindle Surface Grinder

The Hill Acme Co. of Cleveland, Ohio has recently completed the World's Biggest Hydraulic Reciprocating Table Type Vertical Spindle Surface Grinder for heavy stock removal on large die blocks or steel plates up to 54" wide x 144" long. The grinder eliminates the necessity of planing operations prior to final grinding by producing ground finish surfaces from the rough rolled plate, or forged die block.

The entire construction of the 48" wide x 144" long grinder is mammoth. Heavy stock removal on rough steel plates being the prime purpose, all parts are made extra heavy and rugged to withstand the load generated by heavy grinding pressures with a 42" diameter segmental grinding wheel driven by a 125 h.p. TEFC V-belt main drive motor.

The final flat grinding operation to precision tolerances and fine surface finish are likewise accomplished with the 42" diameter segmental grinding wheel. The grinding wheel head travels hydraulically across the table, for two specific reasons: (1) When using the large grinding wheel the entire head is reciprocated on the cross-rail by means of its own hydraulic pump, valves and cylinder so that the 42" diameter grinding wheel will cover the maximum working surface of 54". (2) For certain grinding operations an auxiliary grinding head powered with a 10 h.p. TEFC motor is used. In this case the large grinding head is moved to the back of the machine, thus permitting the auxiliary grinding head to cover the entire width of the table.

The smaller auxiliary grinding head can be moved manually or hydraulically in a horizontal direction — the manual movement being used for final positioning, while the hydraulic movement is used for the initial positioning. The auxiliary grinding head is also equipped with manual vertical movement for fine feeding or to permit grinding of shoulders or posts with the side of the grinding wheel. This auxiliary grinding head can be provided with a 12" diameter (maximum) cup type grinding wheel for precision finish operations.

The 48" x 144" semi steel table is reciprocated by two opposed bronze lined cylinders and steel pistons with the hydraulic oil pressure sealed by Chevron type packing. The low pressure hydraulic system is complete with a 20 h.p. hydraulic pump motor coupled to a large capacity hydraulic pump, together with the necessary flow control valve to regulate the table speed—also directional valves and solenoid operated "start-stop" valves to provide smooth, positive and economical operation.

The grinder is equipped with two motors for the vertical movement of the entire cross-rail and grinding heads. A 3 h.p. constant speed motor connected through a gear box to the elevating screws raises and lowers the rail and grinding head at approximately 5" per minute and is used for initial positioning of the grinding wheel over the work to be processed. The second motor, a 1 h.p. gear head motor connected to the elevating screws through the common gear box and a magnetic clutch is used for the final positioning of the cross-rail and feeding the large vertical spindle grinding head into the work. Precision feeding within .00025" is easily accomplished. A large indicator directly above the feed lever accurately records the depth of cut being taken in thousandths of an inch and a "percent of load" meter in the same area indicates the grinding load on the 125 h.p. main drive motor. The heavy massive cross-rail insures rigidity and permanent accuracy. ● ●

The wheel is of the 42" dia. segmental type driven by a 125 hp motor. The grinding wheel head travels hydraulically across the table. The grinder is equipped with two motors for the vertical movement of the entire crossrail and grinding heads.

Oscillating Grinding Values Established With Standard Data . . . Part 2

By **E. A. Cyrol,** president
E. A. Cyrol & Co.,
Management Consultants,
Chicago, Ill.

Standard Data Will:

- ✓ provide good production standards
- ✓ eliminate misunderstanding between management and union
- ✓ establish standards on short run production
- ✓ eventually ease lengthy time studies
- ✓ increase effectiveness of wage incentive programs

This is the second part of a series of articles by E. A. Cyrol covering the development and use of standard data for grinding operations.

Mr. Cyrol is a well-known author in the technical field. He is the author of "Standard Data for Turret Lathes and Hand Screw Machines," and has written extensively for magazines in the machine tool industry.

THE VALUES for oscillating grinding in this article have been developed from Standard Data. The detail of how the Standard Data was developed was described in the first article.

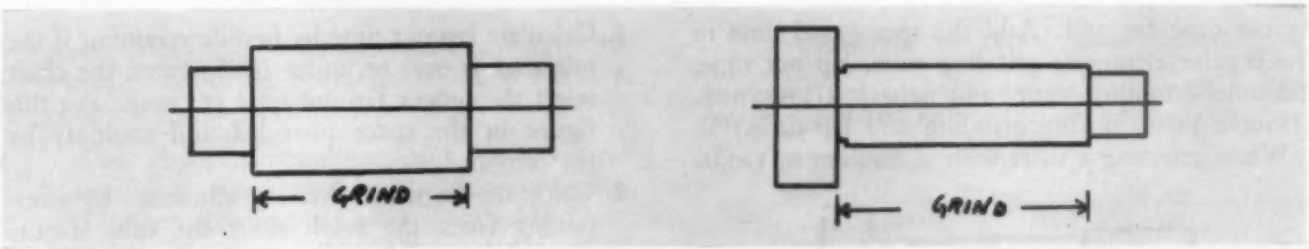
Standard Data was developed by taking a large number of time studies. The elements of each study were broken down in a similar manner for each study. Special attention was given to segregating the constants and variables. The watches were read at the same end points so that the same element on a different study would be comparable.

The levelled average time for each element on a study was posted to a spread sheet. The times for an element were then compared. An average was made of all the constant elements and a graphic analysis made of all the variable elements. The resulting values were then put in a form that is easy to use.

There are two sets of data presented. The first is from a plant doing work on small parts and flexible or thin wall sections. The second set is from a plant handling a heavier class of work. These two sets of data should only be used as bench marks and a guide as to break down that which can best be used to check and develop data for your plant.

Types of Oscillating Grinds

When grinding a shaft as illustrated, the Regular elements of Grinding time, Lap out time, Machine handling time and wheel dress allowance



apply. (Handle pieces during grinding and lapping time.)

When grinding a shaft with a shoulder at one end, the wheel cannot overlap on that end. An allowance must be made to spot grind that end. To figure the allowed time, refer to the spot grind chart, find the amount of stock to remove, subtract .002, then multiply the number of thousandths

OSCILLATING GRIND STANDARD DATA WORK SHEET

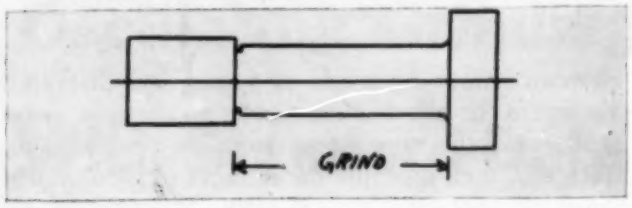
DIAMETER OVER	DIAMETER THRU	Time/in. TABLE TRAVEL	Lap out Time Per Inch: Over .0005 Tolerance	Lap out Time Per Inch: .0005 & Under Tolerance	CU. IN. STOCK REMOVED / .001/1" Lgth.
0	.750	.0052	.026	.043	.0012
.750	.875	.0060	.033	.055	.0014
.875	1.000	.0069	.035	.058	.0016
1.000	1.125	(.0078)	(.039)	.065	(.0018)
1.125	1.250	.0088	.044	.073	.0020
1.250	1.375	.0097	.046	.078	.0022
1.375	1.500	.0106	.048	.085	.0024
1.500	1.750	.0120	.056	.094	.0028
1.750	2.000	.0139	.064	.105	.0031
2.000	2.250	.0157	.072	.115	.0035
2.250	2.500	.0176	.075	.125	.0039
2.500	2.750	.0194	.081	.135	.0043
2.750	3.000	.0213	.085	.143	.0047
3.000	3.250	.0231	.090	.152	.0051
3.250	3.500	.0249	.096	.161	.0055
3.500	3.750	.0268	.100	.169	.0059
3.750	4.000	.0287	.104	.178	.0063
4.000	5.000				.0079

PART NUMBER 7542	
OPERATION NUMBER 80	
PART NAME SHAFT DEPT. 40	
TYPE MACHINE NORTON 6X18	
MACHINE NUMBER	
DIA. OF PIECE 1.064 LGTH. 6.45	
DESCRIPTION OF OPERATION GRIND 1.064 DIA. ±.001 ±.000	
GRINDING WHEEL NO. 5A80L-12-V20	
R. P. M. 380	
POSITION OF TABLE	(.075)
MACHINE HANDLING TIME	(.281)
SECURE PIECE IN STEADYREST	.100
CLEAN UP OF RADIUS	.055
TOTAL EXTRA ALLOWANCE	.356

Time per in. of table travel x Length of grind x 1667 x STOCK REMOVED = GRINDING TIME .0078 x 6.55 x 1667 x .014 = 1.192	1.192
Lap Time per in. x Length of grind = LAP OUT TIME .039 x 6.55 =	.255
CU. IN. PER .001 PER inch length x Length of Grind X Stock Removed = CU.IN.STOCK REMOVED .0018 x 6.55 x 14 = .165 Pc/Dress 21 Time/Piece .145	.145
Time Per .001 x (No Thousands Removed -2) = SPOT GRIND .024 x (14 -2) = 2.88	.288
TOTAL MINUTES/PC	2.236
PERSONAL AND UNAVOIDABLE 11.1	.248
DATE 1-27-55 — TOTAL	2.484
COMPUTED BY R B.C. — 20% INCENTIVE FACTOR	497
CHECKED BY — TOTAL	2.981
APPROVED BY — HRS. PER 100 PIECES	4.968
APPROVED BY — PIECES PER HR.	20.2

by the time for .001. Add the spot grind time to the regular elements; grinding time, lap out time, machine handling time and wheel allowance. (Handle pieces during grinding and lap time.)

When grinding a shaft with a shoulder or radius



on both ends, the wheel cannot overlap on either end. Therefore, an allowance must be made for two spot grinds, one on each end. To figure the allowed time for each spot grind, find the number of thousandths of stock to remove, subtract .002, then from the spot grind chart find the time allowed for removing .001 of stock off the diameter, multiply the time by 2 to get the allowance for the spot grinding of both ends. An allowance must be given for the blending of a radius after grinding the straight part. The allowed time for each radius blend is .055. There is also an allowance of .078 to position the table from one radius to another. There is a value of .100 min. for seating the piece in a steady rest with a clamp to secure piece. Add the approximate combinations of the above to the regular elements of grinding time, lap out time, machine handling time and wheel dress allowance. (Handle pieces during grinding and lapping time.)

Explanation of Oscillating Grind Standard Data Work Sheet

A production standard and a record of the methods used can be obtained by following these steps:

1. Fill out right side of work sheet with - Date - Part Number - Operation Number - Part Name - Type of Machine - Machine Number - Department Number - R.P.M. setting of work speed - Diameter of piece - Length of grind - Description of operation - Tolerance - Wheel grade Number.
2. Determine from the blue print or operation sheet the size of the diameter that is to be ground. Refer to the chart on the Work Sheet and immediately to the right of the appropriate diameter find the time in minutes per inch of table travel. From the print and operation sheet, find the amount of stock that's left for the grinding operation and the length of the grind. Fill in spaces in formula (Note 1) and proceed to calculate the grinding time.
3. Calculate lap out time by first determining if the tolerance is over or under .0005. From the chart select the proper lap out time per inch. Put this figure in the space provided and multiply by the length.
4. Calculate the wheel dressing allowance by ascertaining from the work sheet the cubic inches of stock removed per .001 per inch of length for the diameter being ground. Multiply the length of the grind by amount of cubic inches per .001 of stock, then multiply by number of thousandths of stock removed. The result will be the total cubic inches of stock removed. Refer to the wheel dressing chart which will give the total number of pieces per dress, and total allowance per piece. Put the allowed time in space provided on the work sheet.
5. Refer to the illustrations of the types of oscillating grinds and pick out the example which compares closely with job being run. Add the elements which are necessary to complete piece.
   A. To calculate spot grind, refer to the spot grind chart, find the time allowed per .001 of stock removed and then multiply number of .001's stock removed minus two thousandths.
   B. Add .075 min. to position the table after a spot grind.
   C. If a radius is blended at one or both ends, add .055 min. per occurrence.
   D. If needed, add the value of .078 min. for positioning the table for blending the radius at the other end of the grind.
   E. If the piece has to be secured in the steady rest, add the time value of .100 min.
   F. Always add the .281 constant for machine handling time. (This is composed of the following elements.)

Pick up and position piece between centers from table 18"	.069
Start work head by moving lever up	.020
Start coolant - by lever	.021
Position table to grind	.036
Retract wheel and stop table	.030
Stop coolant	.022
Stop Workhead	.020
Remove piece from centers and aside to table	.063
Total	.281

6. Compute by adding the time values for all the elements used. Add the 11.1% personal and unavoidable delay allowance and the 20% incentive factor (Note 2). Divide the total allowed minutes per piece by 60 to obtain the hours/

Note (1) The feed is approximately .006 inches per pass or .0012 per oscillation. The time per oscillation is the time per inch × length × 2.

$$\text{Grinding time} = \text{time/in.} \times \text{length} \times 2 \times \frac{\text{stock removed}}{.0012}$$

$$= \text{time/in.} \times \text{length} \times 1667 \times \text{stock removed}$$

Note (2) If wage incentives are not used, this 20% adjustment can be considered as an adjustment factor to reflect what can be expected under daywork conditions. It is anticipated that with wage incentives the production will be 20% greater than the pieces per hour shown on the work sheet.

piece. Multiply by 100 to obtain hours per 100 pieces. Divide the hours/piece into one (1) to obtain the pieces per hour.

After the production standard has been calculated and transferred to the Shop Routings and Payroll Records, the work sheet is then filed for future reference. Should a standard be challenged, the work sheet and all its information, including description and calculations, will be the basis of any investigation of the standard.

Wheel Dressing Chart

VOL. GROUND	MILD STEEL		H. T. STEEL	
	Pos. Per Dressing Time		Pos. Per Dressing Time	
Up to .025	50	.060	35	.087
.050	43	.071	30	.101
.075	37	.082	25	.122
.100	32	.095	22	.138
.125	27	.113	18	.169
.150	24	.127	16	.190
.175	21	.145	14	.217
.200	19	.160	13	.234
.225	17	.179	11.5	.264
.250	16	.190	10.5	.290
.275	14	.217	9.5	.320
.300	13	.234	9.	.338
.325	12.5	.243	8.5	.358
.350	12	.253	8.	.380
.375	11	.276	7.5	.405
.400	10.5	.290	7.	.434
.425	10	.304	6.5	.468
.450	9.5	.320	6.2	.490
.475	9.	.338	6.	.507
.500	8.5	.358	5.5	.553
.550	8.	.380	5.4	.563
.600	7.5	.405	5.3	.574
.700	7.	.434	5.2	.585
.800	6.5	.468	5.	.608
.900	6	.507	4.7	.647
1.000	5.5	.553	4.5	.676

Average Dressing Time 3" Wheel 3.04 Min.

Spot Grind Chart

Time To Remove .001 Stock From Various Diameters

Diameter Over	Diameter Thru	Time Per .001 Inch	Diameter Over	Diameter Thru	Time Per .001 Inch
0	.250	.012	2.000	2.300	.036
.250	.550	.015	2.300	2.600	.040
.550	.850	.190	2.600	2.900	.043
.850	1.150	.022	2.900	3.200	.047
1.150	1.450	.026	3.200	3.500	.050
1.450	1.700	.029	3.500	3.800	.054
1.700	2.000	.032	3.800	4.100	.058

Selections of Work Speed Chart

Revolutions per minute to use on work speed to get a recommended 100 surface feet per minute.

Diameter of Work	R.P.M. to use
.250	1527
.500	764
.750	509
.875	436
1.000	382
1.125	339
1.250	305
1.375	278
1.500	255
1.750	218
2.000	191
2.250	170
2.500	153
2.750	139
3.000	127
3.250	117
3.500	109
3.750	102
4.000	95
5.000	76

Cylindrical Oscillating Grinding on Heavier Parts

The following tables have been developed for a grinding department doing a heavier, less flexible class of work than that covered in the preceding data. It should be noted that the two sets of data will not produce similar results in all areas. Again, standard data should be developed for the individual plant because the condition of the equipment, material handling methods and plant practices can all have an influence.

Stock Handling Values

Weight Lbs/pt	*Skid To Table	*Table To Skid	Insert Part Plain	Insert Part Flanged	Remove Part
5	.058	.063	.140	.173	.087
10	.081	.092	.136	.173	.098
15	.102	.119	.138	.181	.112
20	.125	.149	.152	.198	.126
25	.146	.179	.170	.219	.139
30	.168	.202	.189	.241	.152
35	.189	.230	.207	.262	.166
40	.210	.257	.226	.283	.179
45	.230	.285	.244	.304	.193
50	.252	.313	.263	.325	.206
55	.274	.342	.281	.347	.219
60	.296	.372	.300	.368	.232

*Add only the amount that exceeds the grinding time if machine is on automatic feed.

Constant Values

1. Air clean centers .034
2. Stamp operators mark .062
3. Advance wheel to work .064 (1)
4. Advance wheel to shoulder .106 (1)
5. Back off wheel .039 (1)

   (1) If necessary to traverse table longitudinally to clear part while backing off or advancing wheel, add .007 min. for each inch of table traverse.

6. Inspection

Straight Grind	Rough	.035
	Finish, No Indicator	.145
	Finish, Indicator	.036
Taper Grind	Rough	.033
	Finish	.106

7. Grind face of shoulder—Add the following to the regular grinding time:

   Under ¼"—.150; 17/64 to ⅜"—.180; 25/64 to ½"—.200

PLUNGE & TRAVERSE

Cu. in. Metal Removed	Rough Grind		Finish Grind		One Cut Rough & Finish	
	Mild Steel	H. T. Steel	Mild Steel	H. T. Steel	Mild Steel	H. T. Steel
.025	.870	1.030	.940	1.150		
.050	.940	1.110	1.040	1.260	.930	1.180
.075	1.000	1.190	1.140	1.360	1.020	1.270
.100	1.070	1.270	1.230	1.470	1.100	1.380
.125	1.130	1.350	1.330	1.580	1.190	1.510
.150	1.200	1.420	1.430	1.690	1.280	1.630
.175	1.260	1.500	1.520	1.790	1.390	1.760
.200	1.330	1.580	1.620	1.900	1.510	1.900
.225	1.390	1.660			1.630	2.050
.250	1.460	1.740			1.750	2.220
.275	1.530	1.820			1.880	2.380
.300	1.590	1.900			2.020	2.570
.325	1.660	1.980			2.160	2.740
.350	1.720	2.060			2.320	2.930
.375	1.790	2.140			2.470	3.120
.400	1.850	2.220			2.640	3.300
.425	1.920	2.290			2.800	3.520
.450	1.980	2.370			2.970	3.740
.475	2.050	2.450			3.140	3.960
.500	2.120	2.530			3.340	4.180
.525	2.180	2.610			3.540	4.440
.550	2.250	2.690			3.750	4.700
.575	2.310	2.770			3.950	4.960
.600	2.380	2.840			4.160	5.230
.650					4.570	5.750
.700					5.000	6.280

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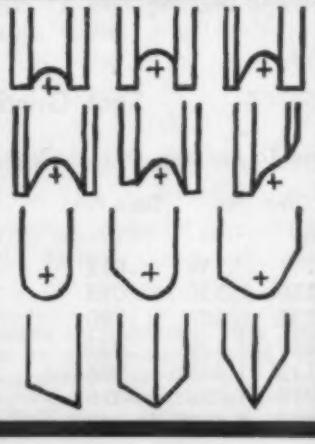


JEON MANUFACTURING COMPANY

Post Office Box 6750 **Washington 20, D. C.**

Encircle No. 206 on card opposite Page 68

Two Chucks Simplify Grinding of Odd Shaped Parts

By **George D. Davis,**
Plant Superintendent
International Molding Machine Co.
La Grange Park, Illinois

- can set up profitably for one piece
- usual run is about 4 to 6 pieces
- set up time is less than five minutes
- will expand grinding machine capacity from 36" to 40"
- adaptable to four common types of surface grinding machines

● TWO SIMPLE chucks developed in this plant allow surface grinding of a wide variety of odd-shaped parts that once could be machined only on our vertical boring mills or lathes at far greater cost.

It was our constant search for ways to lower costs that led to our development of these fixtures. They also represent one of the most important areas open to us for improving efficiency of our operations—that of better, lower-cost short-run machining procedures. Being manufacturers of high unit cost heavy foundry equipment for multiple and precision molding, our natural marketing situation is such that we are denied the usual economies of long-run production. Also, we have what for most industries would be an exceptionally broad line of products, there being some 90 standard models of our foundry molding equipment, in approximately 1,400 different sizes.

Both the three-jaw chuck fixture, and the box type fixture to be described have greatly expanded the versatility of our vertical surface grinding machines on which they are used, and they have so completely adapted these grinders to short runs that we can actually set up profitably for only one workpiece. Our usual run will involve perhaps four to six pieces, however.

Set up time for either fixture is less than five minutes, and is not tricky. It can be duplicated exactly at any time. Shifting set ups therefore is so straightforward that grinding output is steady and predictable.

Total machining time per workpiece is as much as six times faster using the fixtures and surface grinding, compared to doing the same job on our boring mills or lathes. Costs are about half.

The first fixture, the three-jaw chuck, is shown in Figure 1. One of the typical applications of this fixture is holding cast steel platens rigidly in position for surface grinding.

Another important component which is regularly surface-ground in the three-jaw chuck is the cast iron table shown in Figure 2 (bottom).

The three-jaw chuck, which weighs roughly 200 lbs., can hold any odd-shaped workpiece having a

"... total machining time per workpiece is as much as six times faster using the chucks and surface grinding, compared to doing the same job on our boring mills or lathes. Costs are about half."

diameter, or lateral dimension, up to 24″. Height of the workpiece is limited only by capacity of the machine and varies slightly with grinding wheel wear. An average in our installation is about 17″, chuck to wheel.

The circular mounting plate was flame-cut to a 36″ diameter from hot-rolled plate. Three ordinary, independent, jaw-type chucks are mounted in the T-slots, which were formed from cold-rolled bar stock bolted to the mounting plate.

The second fixture is on the order of a box chuck, and like the other is chucked magnetically to the grinder bed. However, where the three-jaw chuck grips the workpiece in a "pincer" the box chuck requires the workpiece to be bolted to the "table top" portion of the fixture.

This second fixture was designed particularly for holding work having an "overhang," such as roll-over frames and draw arms used in our foundry molding machines.

Construction of the box chuck fixture is apparent in the sketch of Figure 2 (top). Leg sections are cast steel, while the "table top" portion is hot-rolled steel plate tapped to receive workpiece mounting bolts.

Either of these chucks are readily adaptable for use on any of the four common types of surface grinding machines: Horizontal-spindle, reciprocating table; horizontal spindle, rotating table; vertical spindle, reciprocating table; or vertical spindle rotating table.

This naturally provides eight possible applications for the two chucks, and it is to be expected that none of the eight different plants exemplifying these operations would use the chucks exactly the same as any other. The possible variations are too numerous to elaborate upon.

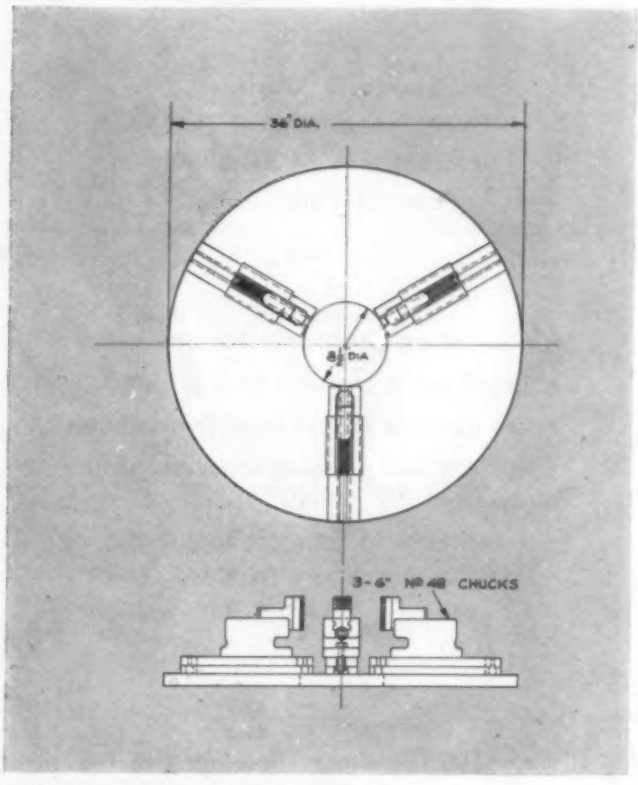
These chucks have still other important applications where large castings, stampings, or other parts of non-ferrous metal are being ground. The usual magnetic chuck being ineffective, metals such as magnesium, aluminum and various others require some means other than magnetic for chucking purposes.

The three-jaw chuck is particularly suited for parts of non-ferrous metals which either have no threaded elements which are adaptable to mounting, or where the grinding operation precedes the tapping or threading operations.

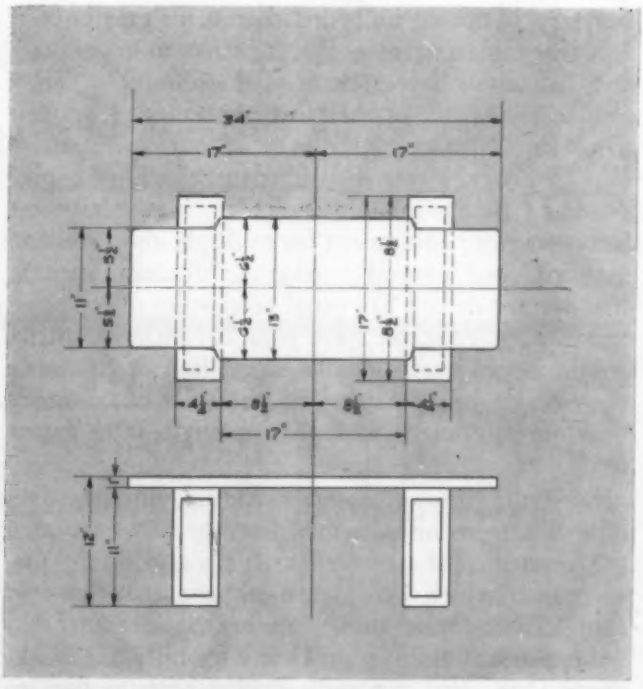
If suitable threaded studs or tapping exists, and especially if the part has been designed with an overhang, it often is more convenient to utilize the box type chuck.

There is nothing to be preferred between the two chucks described from the standpoint of rigidity, both being capable of holding the workpiece with absolute firmness. However, since use of the box chuck requires mounting bolts, it is to be expected that the three-jaw chuck—readily and quickly adjustable as it is—will speed up the total machining time involved by permitting quicker manipulating of the workpiece in and out of the chuck.

A further advantage in the use of chucking devices of this sort is expansion of the dimensional capacity of the machine. Where grinding is limited to the approximate bed dimensions in directly-chucked work, use of a fixture of either of these



1. Sketch showing chucking plate.



2 (top). Fixture for drop-over set-up.
2 (bottom). A component regularly ground with the three-jaw chuck.

types often will expand grinding capacity up to as much as 10%. In the case of the three-jaw chuck fixture used on our vertical spindle grinder we often are able to expand maximum dimensions from 36" to 40", and where this is not possible it is usually possible to reach 39½".

Variations of these chucking accessories will suggest themselves where a particular machining problem is encountered.

For example, grinding fixtures could be developed which use the principles of any of the common "special" chucking devices to be found in the average machine shop or plant. The problem, or more specifically, the workpiece, may be more easily handled by using a two-jaw box chuck. This would be the case where the work always came through with two parallel sides, the piece being located on the grinder so that the grinding direction is normal to the parallel sides. Where grinding pressures are light, however, attention to location with respect to wheel direction perhaps would not be as important.

Where an odd size part of irregular shape must be ground on a production basis, a logical adaptation that suggests itself is a power chuck.

A chuck of this sort could be developed along the lines of the three-jaw chuck described above, which would enable the operator to chuck, grind, and release a part rapidly and thereby greatly increase grinding output. Size of the workpiece would of course be limited to that no larger than could be hand-fed repeatedly without involving excessive operator fatigue. ● ●

Radii Forming Requires Surface Grinder

A surface grinder, figure 1, was used for forming the radii on pump vanes because of its large table capacity (10" by 30") which permitted permanent crush dressing setups while allowing ample room for work. The grinder selected had to prove in conventional use its ability to produce fine ripple-free finishes and respond accurately to adjustment of controls.

A special fixture, figure 2, used in conjunction with the magnetic chuck holds 312 of the tiny vanes arranged in rows with spacers inserted between the rows. The wheel is crush-dressed to a profile which will impart the desired contour to the edge of the vanes and since a radii is being ground on the vane, the form on the wheel is in the nature of a complementary indentation, figure 9. There are several rows of these indentations to match the number of rows of vanes in the fixture.

Once started on its automatic cycle, the grinder, arranged for "automatic downfeed," will continue to lower the grinding wheel in desired increments to the limit established by an adjustable stop. Downfeed increment is adjustable from .0002" to .080" and can be arranged to take place at one or both ends of the table stroke. While one chuck load is being ground, another is loaded by the operator who is not required to be in constant attendance at the machine.

Figure 1. A standard DoAll D-10 surface grinder (10x30" table) is used to grind the radii on rectangular pump vanes. Fine finish and high production obtained with this method eliminated the need for lapping.

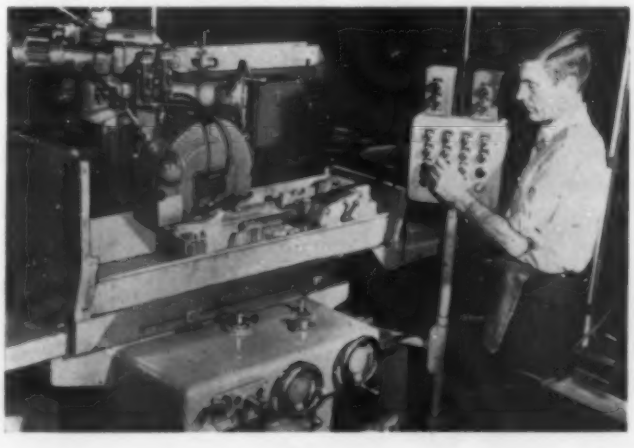


Figure 2. A special fixture employed with the magnetic chuck holds the vanes which are arranged in row with spacers. Each fixture holds 312 vanes and four chuck loads (1248 vanes) are ground each hour per machine. Operator loads one fixture while grinder is finishing another.

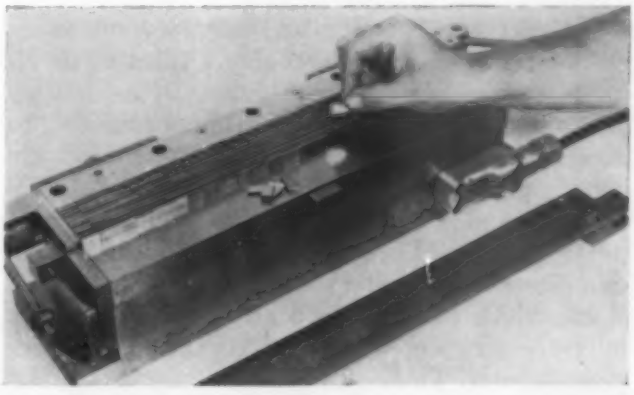
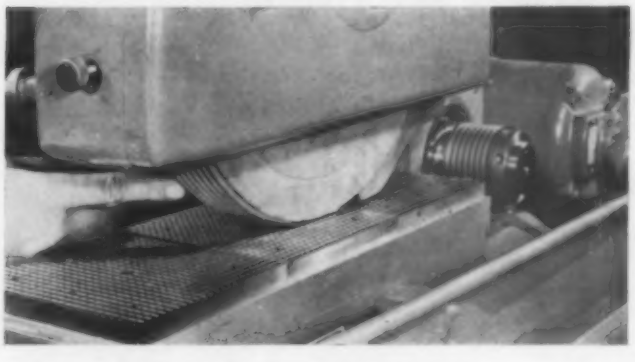


Figure 3. Principle of crush form grinding is demonstrated here. Grinding wheel is crushed to form with steel crush roller at right of wheel. The wheel reproduces this form in the work as shown. This method in conjunction with the standard automatic grinder features, permits mass production with precision and finish comparable to tool room made parts.



A grinding and finishing SAFETY FEATURE

No Man Is Above Safety

By **Edmund Mottershead,** President
Mottershead Associates,
Chicago, Ill.

● EVERY YEAR more than 300,000 workers suffer eye injuries, representing roughly a third of all injuries received in industry. This is truly an inexcusable condition, when it is realized that, according to expert analysis, over 95% of all eye injuries are entirely preventable, eliminating an annual financial loss estimated as being well over 200 million dollars.

The problem of preventing eye and other injuries on operations involving the use of grinding wheels is one which has received a great deal of attention by every grinding wheel and grinding equipment manufacturer. These manufacturers are aware that accidents occur through **negligence,** through **carelessness,** and through **improper** use of the products they make. Consequently they have carefully established proper methods of installing, testing, and using grinding wheels and equipment, and they have gone to great lengths to make that information available to the grinding wheel operator on the job.

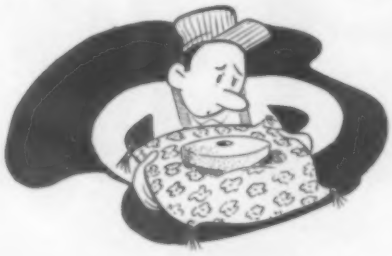
Grinding is **not** a dangerous occupation. The hundreds of thousands of grinding wheels in daily use with only occasional accidental breakage prove their safety.

The important thing to consider is that the physical nature of the grinding wheel limits the conditions under which it may be operated either efficiently or safely.

Technically, the bonding agent (holding the particles of the wheel together) must be just strong

DO always wear safety glasses

DO check mounting flanges for equal and correct diameter



DO always handle and store wheels in a careful manner

DO check maximum operating speed established for wheel and against machine speed

enough to secure the exposed layer of abrasive cutting particles until they become dulled beyond further use, and then must break away, from increased "drag" to relieve the dull grains and present a new layer of sharp grains. This process is progressive and continuous. A stronger wheel would not break away and would be useless as a production tool.

This limitation results in the development of relatively weak grinding wheel structures for certain critical grinding operations.

Grinding wheel manufacturers are doing their part to insure worker safety on the job by producing wheels to rigid standards developed in over 60 years of exhaustive research, tests, and production experience records. Wheels are carefully made, inspected, packed, and shipped under controlled conditions. Each wheel is normally labelled with its specifications and marked with maximum operating speed which must not be exceeded.

Grinding equipment manufacturers normally provide suitable equipment designed for a host of specific purposes, engineered to provide proper spindle diameters, flanges, guards, and variable speeds so that proper perimeter speeds of grinding wheels may be maintained.

The real problem in grinding operations comes on the job. The user of grinding wheels and equipment must provide for proper storage and handling of the grinding wheels. Wheels should be inspected on arrival using the "ring" test, which should be repeated when wheels are mounted. Suitable flat or vertical storage should be provided, depending upon the nature of the wheels.

Grinding machines are normally designed properly for their uses. However, manufacturers estimate that over 35% of grinding wheel failures may be traced to improper wheel mounting, which introduces internal stresses which cause wheel failure. Arbor or spindle sizes must be correct. Flanges should be at least 1/3 the diameter of the wheel, as the weak spot in a spinning wheel is the whole and mounting stresses should be moved as far away from the center as possible. Operators should know the exact spindle speed of their machine to be able to check against the maximum authorized speed of the wheel he is mounting. This is especially necessary with variable speed grinders.

Once the wheel has been properly mounted, and normal guarding provided for, the operator has only to observe normal precautions in grinding to perform the job safely and efficiently. Goggles, face shields, protective clothing, and other protective devices should be used, depending on the nature of the grinding and flying particles.

Proper guarding of equipment cannot be considered casually. A very major portion of grinding injuries occur with portable grinders used carelessly or abusively without proper guarding. Even occasional wheel breakage can do little or no damage if proper guarding is in place.

Operators must be trained in correct handling of the piece they are grinding, correct operation of their machine, and necessary inspection procedures to take before running any job. Even if some hardy souls cannot be convinced they should take precautions against lacerated face, skin, or hands, they can still be made to understand that the human eye is the most vulnerable and costly target exposed to the hazards of any job. Grinding operations **can** be safe if performed correctly according to known and established methods. ● ●

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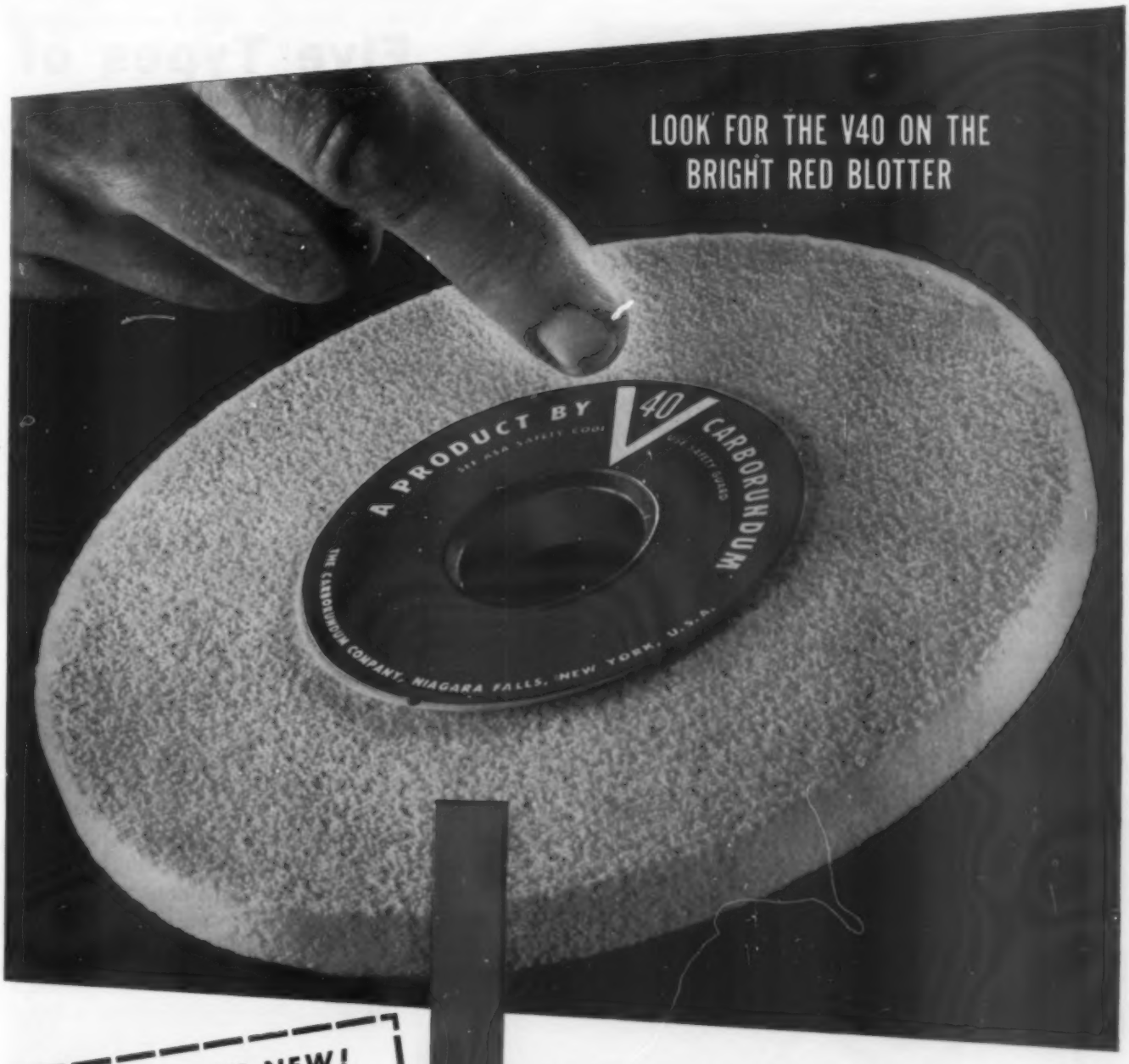

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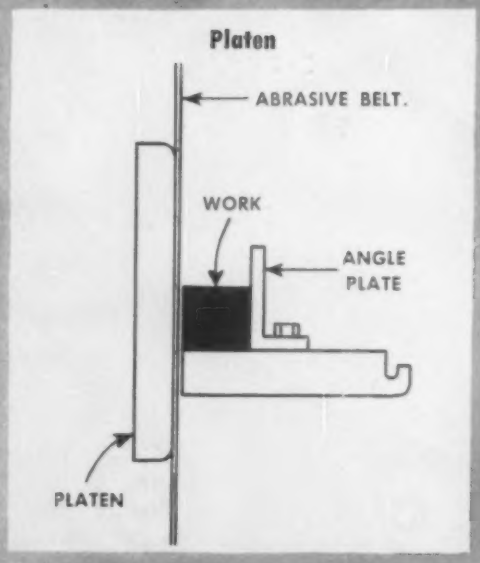
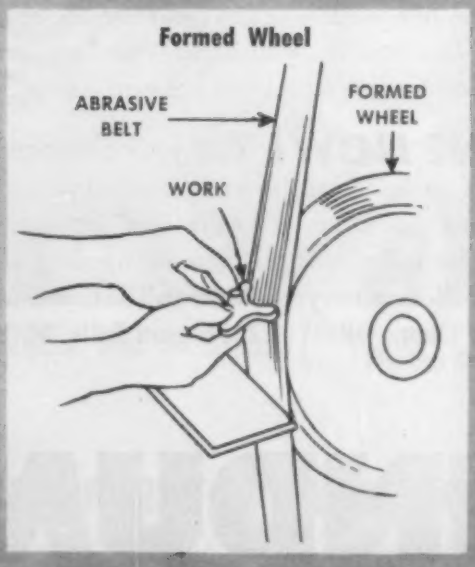
Five Types of Abrasive Belt Machines

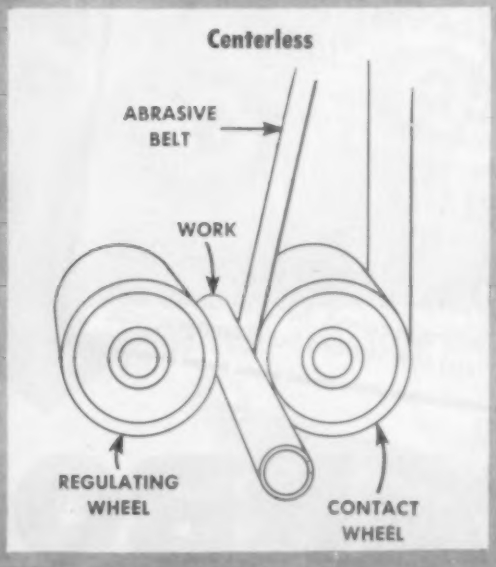
By **John A. Simmons,** Product Mgr.
The Engelberg-Huller Company
Syracuse, N.Y.

● DESIGNED PRIMARILY for low-cost, rapid finishing of flat and irregular-shaped surfaces, abrasive-belt grinders are supplementing—many times replacing—a wide variety of other machine tools. Wet belt grinders are surfacing locating areas, and other jobs ordinarily done on milling machines. Platen grinders are speeding up such tool room chores as squaring, beveling, chamfering or smoothing out welds. Belt surfacers are snagging and deburring forged or cast parts. Abrasive-belt grinders, equipped with automatic work-handling fixtures, are surfacing up to 10,000 parts an hour.

Basically, an abrasive-belt machine consists of drive and idler pulleys supporting and revolving an endless length of abrasive belt. This design simplicity is one key to the wide range of grinding applications which abrasive-belt machinery increasingly covers. Another is the successful development of cloth belts, permitting grinding with coolants. Particles of aluminum oxide or silicon carbide, fastened to belting by moisture-resistant adhesive, can cut away or polish







ferrous or non-ferrous materials, as well as plastics, glass, ceramics, fibres or wood and paper products.

Fast, accurate, high-volume production is possible with abrasive-belt grinders, seldom requiring more than thirty seconds per part. Stock removal is equally rapid on metal, plastic, glass—even carbide parts.

Simple, low-cost, work-holding fixtures can be used on abrasive-belt machines. As the pressure of the belt is constantly downward, over the whole grinding area, and outward toward the fixture, light, fast-loading holding devices are generally sufficient.

From these factors, five basic types of abrasive-belt machining have evolved: platen, formed wheel, flexible belt, centerless, and contact wheel. Each technique has been derived by combining the particular work characteristics of the belting with contoured wheels, platens, or contact wheels of various sizes and hardnesses.

Abrasive belt grinders are supplementing, and many times replacing, other types of machine tools. They are versatile, require little or no fixturing, are fast and accurate, and accommodate a large variety of materials from non-ferrous to ferrous. Belts have been greatly improved over the past years and now qualify as important removing tools.

Platen Grinding

In platen grinding, the work is surfaced on a straight section of the belt which is supported by a platen or backing plate.

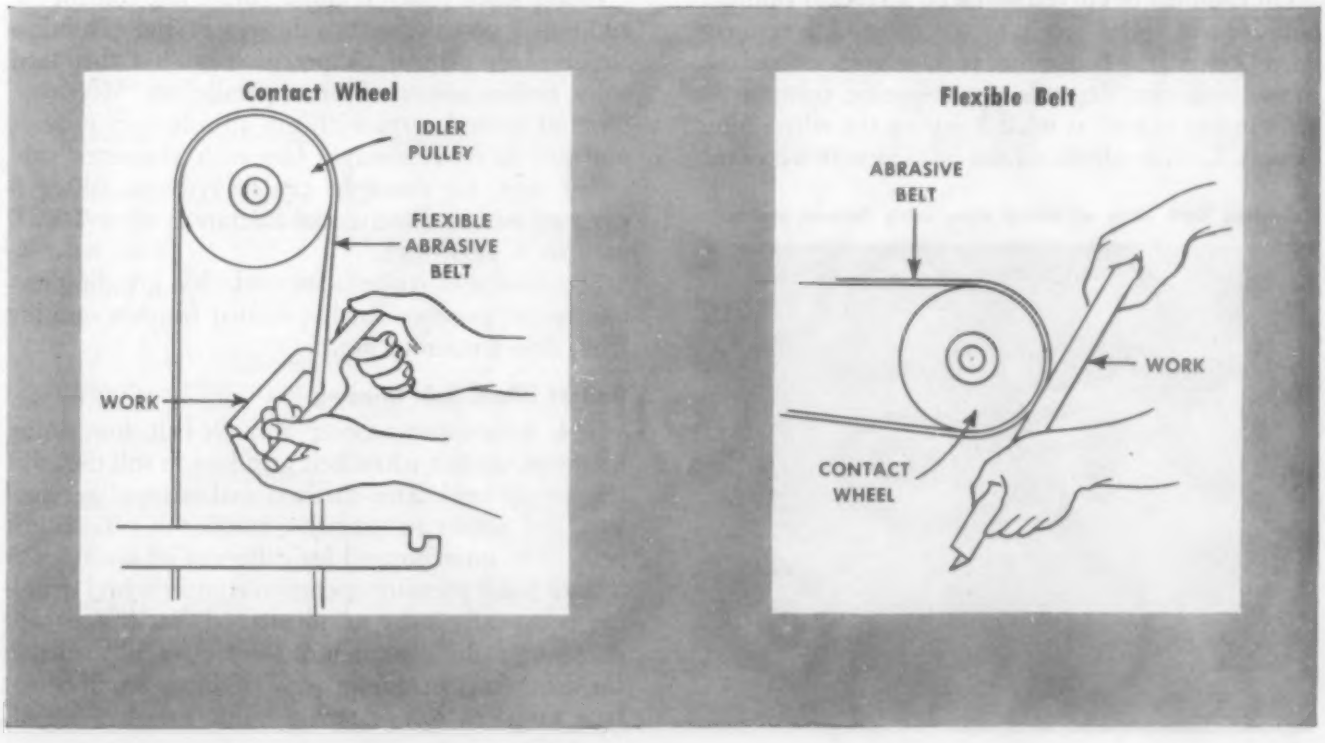
Dry platen grinding is practical for light surfacing operations where excessive heat, dust or loading of the belt is not a problem. Working within these limitations, almost any material can be surfaced by this method. Only glass and certain types of plastics are absolute exceptions.

These limitations for dry grinding do not exist when the wet platen grinding method is employed. The advent of cloth belts, impervious to coolants, not only has eliminated abrasive-belt loading for all types of grind materials but also allows these materials to be more easily surfaced by the wet technique.

The quantity of coolant that actually reaches the grinding area is a prime factor. Unlike cutting with an abrasive wheel or cutting tool, the grinding area in abrasive-belt machining is large. Very little of the heat generated by grinding is removed by conduction. By flooding the work, most of the cooling is done by the coolant's passage over the actual grinding area.

Deep cuts involving removal of a large volume of material are possible with the platen grind method, but generally shallow cuts are preferable. The lighter the cut, the greater the area that can be finished. Maximum stock removal for economical production is about 1/16-inch to ⅛-inch on non-ferrous materials and 1/32-inch to 1/16-inch on ferrous parts. The area to be finished should not exceed 30 to 40 square inches on soft metals, and about half that on iron and steel.

Platen grinding falls into two categories: hand operations, and semi-automatic operations employing automatic in-feed, controlled depth of cut, and pre-set grinding pressure. Hand operations simply



Formed wheel grinding. On rounded or curved surfaces a vertically running belt flexes freely to the form of a resilient wheel behind the belt. Below is a close-up of the fixture and the seven castings.

mean holding the part against the belt by hand pressure, a satisfactory method for light skim cutting. On the other hand, semi-automatic operations allow multiple loading and boost production volume by allowing several pieces to be ground simultaneously.

Formed Wheel Grinding

On rounded or curved surfaces, a vertical running abrasive-belt flexes freely to the form of a resilient wheel behind the belt, either with or without coolant. Wheel selection depends upon specific contour requirements as well as what hardness the wheel must possess. Canvas wheels cannot be used with a coolant,

Deburring both sides of milled slots using formed platen.

but rubber-covered formed wheels are suitable for wet grinding. The formed wheel method can achieve high production output by using automatic indexing heads for holding and rotating the work pieces against the belt. It also results in uniform straight line finish characteristics.

Flexible Abrasive-Belt Grinding

For irregular-shaped products, flexible belt grinding is an ideal surfacing technique. Machines of this type use neither a platen nor a formed wheel. Instead, the flexible abrasive-belt freely removes small amounts of material in inaccessible areas. This method surfaces plastics or light metals, removing gates or flashes without requiring jigs or fixtures. Wet belt grinding is required only for heavy-duty applications. On a standard abrasive-belt machine, flexible belt grinding can be done just below the platen, above the contact wheels, or in a groove across the platen.

Centerless Abrasive-Belt Grinding

Bar or rod stock work ranging from 3/32-inch to 2¾-inches in diameter can be ground and polished in one thorough-feed fixture by centerless belt grinders. The endless abrasive-belt runs over a resilient contact wheel which eliminates chatter and produces a smooth finish. Contact wheels of different degrees of hardness are interchangeable. A regulating wheel controls both the speed and the feed of the work.

Generally, thru-feed rates of 2 to 30 feet per minute are possible, depending upon particular work requirements. For rough grinding, the rates are from 2 to 7 fpm; for semi-finishing, from 12 to 18 fpm; and for polishing, up to 30 fpm.

Heavy stock removal and accurate size control are additional production advantages of the centerless abrasive-belt grinder. A precision-ground thru-feed work fixture assures absolute parallelism. Moreover, dovetail in-feed ways with gib adjustments provide uniform in-feed settings. One-inch diameter cold rolled steel, for example, can be reduced .010-inch per pass within dimensional tolerances of ± .00025-inch to ± .0005-inch.

Standard abrasive-belts for centerless grinding machines can produce finely-polished finishes ranging from 2 to 3 microinches.

Contact Wheel Belt Grinding

The forerunner among abrasive-belt machining methods, contact wheel belt grinding, is still the most frequently used. This method makes rapid yet cool cuts, and allows an extensive number of various grit belts to be interchanged for different jobs.

As a hand pressure operation contact wheel grinding is basically a dry grind method. Backstands and polishing lathe combinations are especially suitable for deburring, snagging, and polishing. Small bench type grinders, roll or swing frame grinders are ex-

tremely versatile maintenance and production tools.

The conveyor type machine—equipped with contact wheel and conveyor belt—is a high production, semi-automatic contact wheel surfacer for wet grinding, polishing and deburring coil, strip, bar or blank stock. Grinding heads can be arranged in series to perform multiple and consecutive grinding operations with one material handling.

The physical requirements of the work material are a consideration when applying contact wheel belt grinding. Soft metals, such as brass, or aluminum, require a belt speed of 7500 feet per minute; forged steel, 7000 feet per minute, cast iron and mild steel, 6500 feet per minute; and alloy and stainless steel, 4500 feet per minute. Although each application sometimes requires preliminary experimentation, these recommended speeds will extend belt life without sacrificing finish quality.

Grinding Tips

Whenever possible, the part should be arranged with its longest dimension across the belt. In this way, a greater width of belt, carrying more coolant, is employed, and faster, cooler grinding is possible. The part should be arranged to minimize the distance that the belt must carry the chips over the work.

In multiple loading, the parts should be staggered or arranged obliquely to facilitate cooling. Rapid oscillation of the parts minimizes heating and prevents the work from burning. To obtain maximum accuracy or flatness, a short, fast oscillation is preferable to a longer, slower one.

Factors that hinder the procurement of a high degree flatness on the part are insufficient belt tension, a worn platen, excessive belt speed, insufficient

An example of multiple grinding and simple fixturing on a large platen-type belt grinder with hydraulic feed table.

A platen belt grinder with hydraulic feed table. Note the inexpensive fixture which is used to grind these aluminum parts. Seven parts are ground in one operation.

Belt Selection and Operating Conditions Recommended for Wet Belt Grinding Over a Platen

Material to be Ground	Abrasive	Grain Size		Belt Speed Surface Feet per minute	Pressure of Work Against Belt	Coolant
		Roughing	Finishing			
Aluminum and Brass	Silicon Carbide	36 to 80	120 to 240	4600 to 5500	Light	Soluble Oil in Water (40 to 1) or Grinding Oil
Copper and Lead	Silicon Carbide	60 to 80	120 to 240	2550	Very light	Soluble Oil in Water (40 to 1)
Cast Iron	Silicon Carbide	24 to 36	60 to 80	2550 to 3550	8 lbs. per sq. in. (New Belt) 25 lbs. per sq. in. (Old Belt)	Plain Water
Soft Steel	Aluminum Oxide	36 to 60	120 to 180	3550 to 5500	8 lbs. per sq. in. (New Belt) 25 lbs. per sq. in. (Old Belt)	Soluble Oil in Water (30 to 1) or Grinding Oil
Hard Steel	Aluminum Oxide	40 to 80	120 to 180	3550 to 5500	Heavy	Soluble Oil in Water (30 to 1) or Grinding Oil
Glass and Ceramics	Silicon Carbide	36 to 80	180 to 320	2550 to 3550	Light	Plain Water
Plastics	Silicon Carbide	80 to 120	320	2550 to 3550	Light	Plain Water

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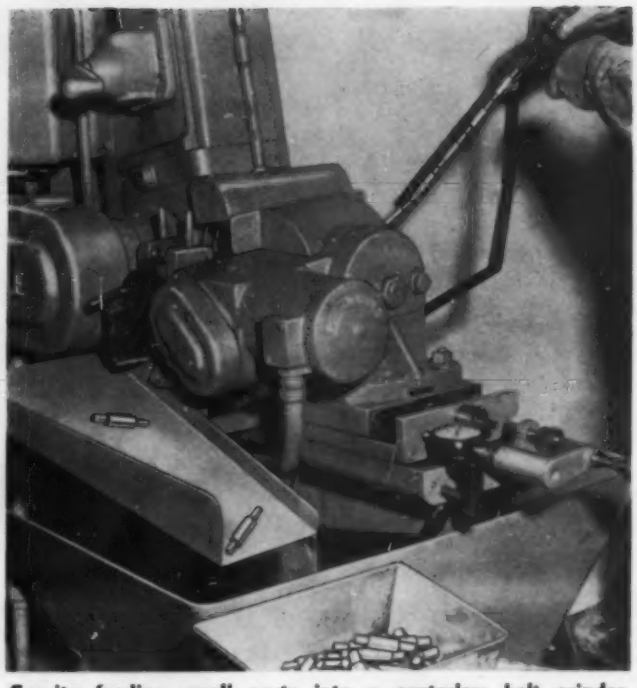


Gravity feeding small parts into a centerless belt grinder. Sizing and finishing is done in one operation.

cooling, uneven pressure on different portions of the work, insecure mounting of the work, too long a grinding cycle, and the removal of too much stock with too fine a belt or possibly with an unevenly worn belt.

Many advantages can be gained by designing the part purposely for abrasive belt machining. Surfaces that are to be belt-ground can be reduced from 50 to 75 per cent in this way. Thus, grinding time is reduced, belt life lengthened, and the weight of the casting decreased. ● ●

". . . and another thing . . . we have no trouble surface-grinding odd shapes."

By **F. J. Henkel,** President

Lamina Dies & Tools, Inc.
Berkley, Mich.

Want to Get More Stampings per Die? It All Depends on How You Grind It

Too often grinding has been blamed for die failure when actually it is the fault of poor heat treating; however, because grinding is the last operation and because imperfections show up after the grinding operation grinding is frequently blamed for cracks.

This article is not concerned with this dispute, it is primarily concerned with efficient grinding practice, assuming all previous operations were performed efficiently and competently.

This is a simple, understandable procedure for building and maintaining dies that will increase the number of parts produced between the sharpenings, provide a consistent number of pieces per sharpening and thus create greater die life and overall economy. Some of the physical changes described as taking place in the steel are assumptions based on countless tests and field research. However, that the recommended procedure will accomplish the stated objectives has been proven on hundreds of dies built and serviced according to it.

● HAVE YOU ever wondered why a die will produce 105,000 pieces one time, and not the next? In fact, from what the pressroom tells you you will probably see a typical record of die production, between grinding, something like this.

first grind:	105,000 pieces,
second grind:	62,000 pieces,
third grind:	91,000 pieces,
fourth grind:	5,000 pieces and a slugged die, broken punch, etc.

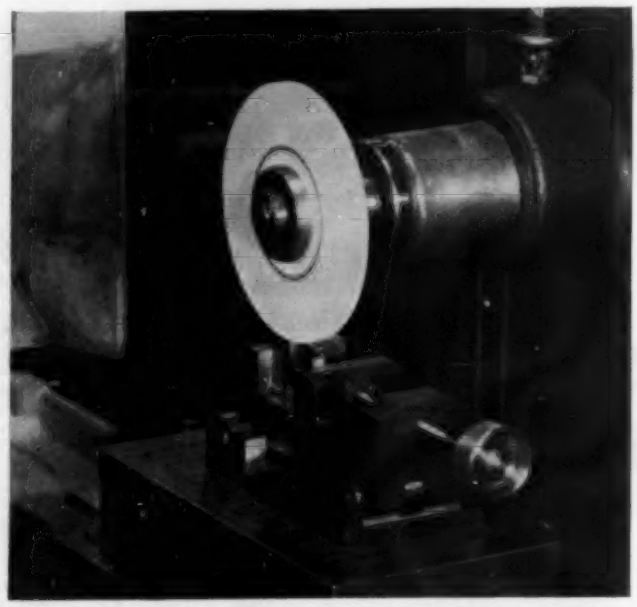
Assuming the die is run on the same press, fed the same stock, and all other conditions are pretty much the same, what causes this variation?

Eight years ago we undertook to find the answers. And we've got them. It's largely among other things, a matter of proper grinding. Before we find out how to grind a die, let's look at the reasoning behind the new grinding method.

What causes variation in die life?

In building a die you very carefully select the steel best suited for the application. You then carefully heat treat that steel to bring out the maximum amount of tensile strength in the steel and thus have the greatest possible resistance to the stresses of stamping service. However, if during the processing of the die after heat treating, you introduce stresses in the steel, these stresses subtract directly from the tensile strength. The amount that the strength is reduced is directly dependent upon the intensity and depth of the stresses introduced.

To evaluate the result of such reduction in tensile strength, let us consider the physical structure of the steel. Hardening steels are made up of carbides held together in a matrix formed by the other elements in the steel. Assuming that the carbides are made up



In this set-up for grinding the face of a die section after heat treating . . . the operator is using a medium-hard wheel with very fine grit which was selected to obtain a low micro-inch surface finish. He used several passes across the wheel when dressing it with diamond. The wheel is operating at approximately 5500 s.f.m. and is removing about .001" per pass.

of homogeneous molecules (all of one kind), if one or more of the molecules breaks away from the carbide particle it is because the particle hasn't the tensile strength to retain it. Likewise, if the carbide itself breaks out of the matrix, it must be because of lack of sufficient tensile strength in the matrix to retain it. Therefore it is obvious that **tensile strength is the all-important factor in the life of a die.** When sufficient stresses are built up in the steel to equal or better the tensile strength of the steel, surface checks appear. (In cases where the stresses are severe enough, surface checks are visible to the naked eye. Beyond this, Magna-flux testing will often show up checks not otherwise visible. However, in most cases, the checks cannot be seen by either of these means but will show up after an acid bath. In any case, the stresses have exceeded the tensile strength of the steel.) Hence, the steel in this weakened condition hasn't the strength to withstand the shock load of stamping production and consequently will break down rapidly causing scoring, slug-binding and other forms of die failure.

The surface of the die section after grinding. The face of the die section has a fine finish and there is no visible damage as the result of grinding.

If surface checks (tensile strength of the steel neutralized) will materially reduce the life of a die, what happens when the stresses created almost equal the tensile strength of the steel but are not quite enough to cause checking? The answer is that the additional stress of stamping service will be greater than the remaining tensile strength at the cutting edge and so the die will break down quickly and require service. When surface checks appear the steel is obviously abused and over-stressed. But stresses that are less than the tensile strength of the steel cannot be seen or detected. Yet these are the stresses to be concerned about since they definitely detract from tensile strength and as a result shorten die life in proportion to their intensity. In effect, these stresses are adversely pre-loading the die steel.

Let us assume that the die is made of steel with a tensile strength of 240,000 psi. If each time the die is ground stresses are introduced into the steel, they absorb some of the steel's tensile strength. This naturally leaves less strength for the stress of stamping service. **The number of pieces produced by the die each time it is ground is proportionate to the amount of tensile strength remaining in the steel.**

Let us take the example used in the first paragraph of this article. On the first grind, very little stress was created and most of the steel's tensile strength was left for stamping service; 105,000 pieces stamped. The second grinding created high stresses and the die only produced 62,000 pieces. The third grind introduced few additional stresses and removed a good part of the stressed material from the second grind; this was a net gain in tensile strength and the die produced 90,000 pieces. On the fourth grind the high stresses created absorbed nearly all the tensile strength and the result was only 5,000 pieces and a broken punch, slugged-die or some other die failure. Naturally, these figures and the amount of stress are hypothetical but we **are certain that something similar to this actually happens when steel is abused in grinding.** Yet in none of these examples was the die surface checked or in any other way visibly damaged.

Therefore, to assure maximum production and life from a die, it is necessary to use a suitable steel, heat treat the steel properly for greatest tensile strength and then maintain that strength——not to totally dissipate it or even use up a portion of it by introducing stresses within the steel during processing or servicing. **To keep stresses at a minimum is of para-**

mount importance when making the die . . . it is equally important when servicing it. To cite an example:

Eight years ago we delivered a die to punch a series of slots and a series of ¼" diameter holes. The customer found that the hole punches would create a .005" burr after 50,000 pieces while the slot punches were still cutting clean. Since there was no other apparent reason for this difference, we decided that it must be due to the fact that the two types of punches **were ground differently and thus had different tensile strengths.** (The slot punches were ground dry on a surface grinder with frequent dressings to maintain form. The hole punches were wet ground according to accepted grind practices on an O.D. grinder with a relatively hard, fine grit wheel.)

To prove this, we turned eight test specimens of the same bar and heat treated them all at the same time. Then four of the pieces were ground in the same manner as the original hole punches and four according to our recommended procedure that follows in this article. **The result was that the latter four punches had 20% greater tensile strength than the four that were ground the first way!** This could only mean to us that the "accepted" manner of grinding had set up stresses throughout the section of these four ¼" punches and that these stresses subtracted directly from the original tensile strength. Further, if a 20% reduction in strength was effected throughout the entire section of the punches, then the damage on the outer surfaces must have been extremely severe . . . and the outer surface is the cutting edge!

How does grinding create stresses in hardened steel?

If you were to take a block of oil or air hardened steel, heat it beyond its critical temperature and then drop it in a tank of water at room temperature, what would happen? The stresses built up throughout the block would crack it through more than likely in several places. You would certainly not have a piece of steel suitable for a metal stamping die. **Yet while following generally accepted grinding practices, hardened dies are subjected to the same treatment.**

It is a known fact that temperatures generated under a grinding wheel range from 1800° F. to 3000° F. Thus, normal grinding, whether producing the holes and slots in the die or sharpening it, heats the steel to a degree considerably higher than its critical temperature. Further, when room-temperature coolant meets the steel at this temperature, it is quenching the steel and thus creating even greater stresses.

The amount of stress introduced is dependent upon the heat generated during the grinding operation — the hotter the steel, the deeper and more intense the stresses. Obviously, if the face being ground and stressed is the wall of a hole or slot, the die maker is introducing stresses that penetrate throughout the depth of the die and can never be removed. If the stresses occur during sharpening, it will take the user several "proper" sharpenings to get down to metal of full strength again or to maximum die life again.

Five steps that will eliminate serious loss of strength due to stress!

The following five steps were developed in our shop to eliminate serious stresses in dies due to grinding. We have applied them on hundreds of dies for customers and then applied them in our customers' service departments. **In every instance the result was more pieces per grind, a consistent number of pieces from every grind and hence longer die life.**

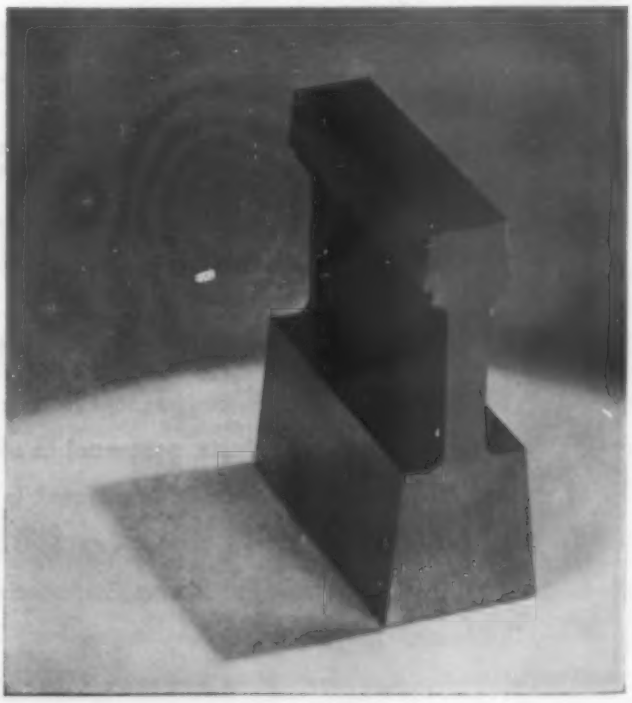
1. **Use A Coarse Grit Wheel**
2. **Use A Medium-Soft Wheel**
3. **Low Wheel Speed**
4. **Use Only One Pass When Finish Dressing**
5. **Take A Shallow Cut**

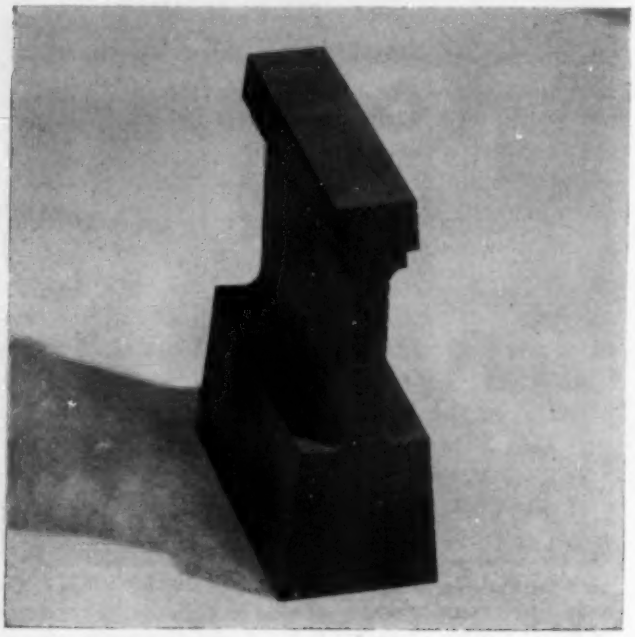
All five of these steps have been determined with only one purpose in mind . . . to reduce the amount of heat generated and the depth that heat penetrates. Here is how each of these steps contributes to that purpose:

1. Use A Coarse Grit Wheel—Fine grit wheels are commonly used to obtain a fine surface finish. However, because of the infinite number of grits in contact with the steel, too much heat is generated. Using a coarse grit wheel, fewer grits are in contact at one time and the result is cooler grinding. Within reasonable limits, the surface finish is not nearly as important to die life as a cooler grinding condition is.

2. Use A Soft Wheel—We recommend a soft

This is the die section after a Magnaflux test. There is still no apparent damage to the steel, and unless the die section is ruined with an acid etch test it would be logical to assume that no damage had been done by grinding.





Now we have the same die section as it appeared after an acid etch. It is obvious, after the acid etch, that stresses almost equal to the tensile strength of the steel were built up from grinding. These stresses reduce the ability of the die section to withstand shock loads to a point where it would have been short-lived had it been used on a production run previous to the acid etch.

wheel because of its free cutting action. This is due to the fact that soft wheels break down more rapidly during the grinding operation and thus are constantly exposing new, sharp grits.

3. Use Low Wheel Speed—Tests show that the slower the wheel turns the less intense the heat generated.

4. One Pass With A Sharp Diamond for Finish Dressing—On the final dressing before grinding, only one pass should be made across the wheel. This pass should be made fast and without hesitation. If additional passes are made without moving in the wheel toward the diamond, the diamond is actually polishing the grits in the wheel and thus dulling them. This has been proven to create unnecessary heat without improving the grinding action of the wheel or the surface finish of the die.

5. Take A Shallow Cut—Naturally the deeper the cut, the more intense the heat will be and the further it will penetrate into the steel. Accordingly, the deeper the stresses penetrate. We have found that the depth of cut should never exceed .0002" when grinding. However, transverse movement of the wheel across the face of the die may be quite rapid (½" or more). These limits on the depth of cut may seem extreme but they are necessary to keep stresses to a minimum intensity and depth.

While wet grinding is commonly accepted, it is far more dangerous because of the quenching action of the coolant. Slight miscalculation on the part of the grinder operator in favor of a deeper cut will result in serious loss of strength to the die.

This procedure obviously increases the cost of building and servicing a die. However, we repeat, that actual records accumulated during the past eight years in our own shop as well as in our customers' shops have proven that the resulting increase in die life will more than offset the increased cost many times over. ● ●

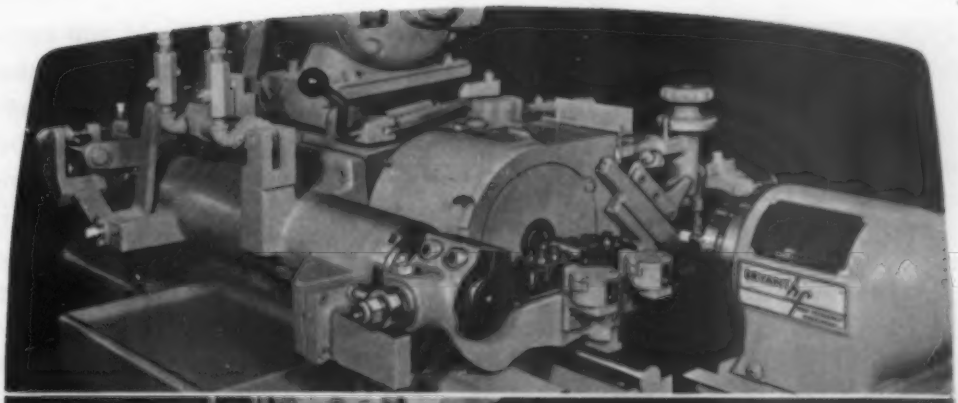
Machines, Wheels, Coolants, Accessories

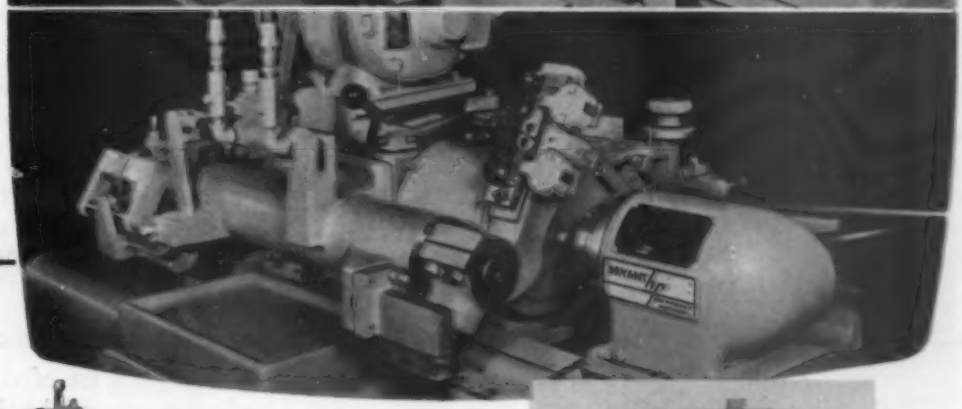
will be described in GRINDING and FINISHING

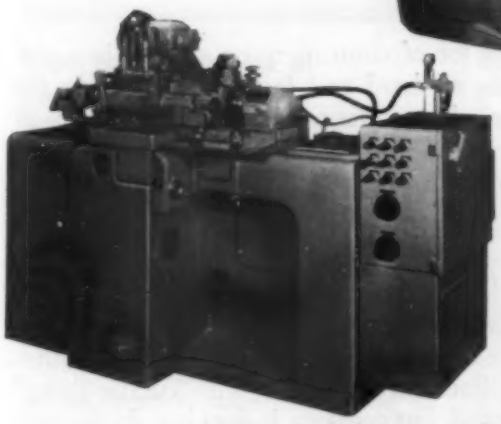
TOOL SHOW ISSUE, AUGUST

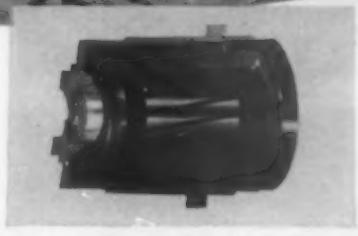
All the exhibitors, products, personnel in attendance, etc. as they pertain to the abrasive industry will be described and illustrated in the August issue. Don't miss it! See what will be shown at the three big shows in Chicago, Sept. 6-17: The National Machine Tool Show, Amphitheatre; Production Engineering Show, Navy Pier; Coliseum Machinery Show, Coliseum.

To cut costs and save rehandling-









BRYANT internal grinder . . . combines boring and grinding operations

These photos show how a Bryant Internal Grinder eliminates rechucking of workpieces, resulting in increased production and reduced scrap at Bendix Aviation Corporation's Eclipse-Pioneer Division.

Here, a Bryant model 1209-Y speeds up a fast moving production line by performing both boring and grinding operations on synchro motor housings. Single point carbide tools bore two holes and a face simultaneously in each housing. The grinding operation consists of grinding the stator bore. A fine ground finish is necessary to eliminate possible burrs in the stator slots which could cause failures. Bryant precision alignment assures concentricity held well within the required .0003" tolerance for size, roundness and concentricity. This method has resulted in cutting scrap more than 50% over previous methods used.

Fully automatic Bryant grinders featuring automatic loading and sizing can be readily integrated into your automated production lines. Models ideally suited for tool room and small lot work are also available.

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Would you consider one type of infeed for all stock removal operations on a lathe, shaper, mill or on any other machining process? Of course not! Diamond truing and dressing of abrasive wheels is also a stock removal process, far more delicate. It must be performed with proper judgment so that form, cutting action and finish result quickly and efficiently. On certain jobs roughing and finishing passes are essential.

Infeed of the Diamond Tool to True and Dress Abrasive Wheels

By **F. M. Bley,** Consulting Diamond Engineer, Valparaiso, Ind.

THERE is a lot of contrariety on this subject and unfortunately no hard and fast rule can apply for all conditions, but understanding the problem will enable the operator to use his judgment advantageously and get fast and efficient results all the time.

From the standpoint of the diamond tool dealer and their representatives recommendations are often made which specify too small an infeed for the diamond tool; such practice will not endanger a weak setting-matrix, it will furnish more "dressing-passes" per diamond tool and it will "cuddle-along" a frail diamond, but actually, it does not do the user of diamond tools any good. In fact, it may often prevent him from obtaining the desired end results.

Of course, there are conditions where a constant, small infeed for diamond dressing is tolerable and perfectly satisfactory when all factors are ideal. But in order to enable us to understand the fundamental principles of the subject, it is better to consider problem jobs, adverse conditions, time and cost factors.

Would you consider one type of infeed for all stock removal on a lathe, shaper, mill or on any other machining process?—Of course not! Well, diamond truing and dressing of abrasive wheels is also a

NOTE: Mr. Bley is well known in industrial circles for his past work with diamonds and diamond metal removal operations. Until recently he was engaged in the manufacture of diamond products: circular and reciprocating diamond saw teeth, diamond core drills and a complete line of diamond truing and dressing tools. He has been actively engaged in research and engineering and brings to diamond problems many years' successful, practical experience. He is now organizing a diamond tool consulting service.

stock removal process, far more delicate. It must be performed with proper judgment so that form, cutting action and finish result quickly and efficiently. It is therefore obvious, that on certain jobs roughing and finishing passes are essential!

Depending on the condition of the abrasive wheel surface, it may be **"glazed"** (cutting particles worn dull and flat—yet held by the relatively hard bond) or it may be **"loaded"** (certain alloys being picked up and penetrating the wheel surface) or it may have lost its **"form"** (partial break-down of the wheel, delicate shapes, corners, lost gage, out of round, out of true, etc. etc.). In some cases any single condition may be found, in others a combination of all three may exist.

Roughing and Finishing. The dressing operation should consist of **one** initial heavy infeed (roughing pass), to be followed by one or several passes (finishing), depending on the finish required, with infeeds becoming lighter and lighter with each subsequent pass.

The initial infeed must be "small enough" to prevent overheating of diamond and tool-matrix and to avoid wasteful stock removal of the wheel. On the other hand, the initial infeed must be "large enough" to remove the "loaded" surface of the wheel, to break out the dulled and "glazed" cutting particles and to expose new, sharp cutting grit!

Coarse grit wheels require proportionately heavier initial infeeds than fine grit wheels.

Too small an infeed at the start of the dressing cycle will push back into the bond the loaded material instead of removing it. Also it will dull the newly exposed cutting particles and slick and glaze the wheel surface.

Such infeeds also wear and dull the diamond point of the dressing tool much more rapidly than the indicated, somewhat heavier roughing pass would do.

Initial heavy infeeds for roughing may vary from .001 in. to .003 in., while light infeeds for finishing may be made with as little as .0005 in. down to .00015 in. per pass. ● ●

Plan Joint Operation of Spar-Mica Corp.

A partnership for the mining processing and marketing of feldspar, mica and other industrial minerals is being negotiated by two Buffalo corporations.

They are Electro Refractories & Abrasives Corp. and Strategic Materials Corp., which plan joint operation of Spar-Mica Corp. Ltd. of Montreal, Canada.

The negotiations were reported by the presidents of both firms, Grant S. Diamond of Electro and John C. Udd of Strategic. Mr. Diamond also has been president of Spar-Mica since it was organized two years ago, and will continue in that capacity.

The directors of the two companies are expected to act on the equal partnership proposal in June. Spar-Mica now is a sub-subsidiary of Strategic. Electro proposes to acquire an equal interest with Strategic in Spar-Mica for a cash payment of $333,500 and 10,000 shares of Electro's common stock, currently quoted at $18 per share.

In addition to Mr. Diamond, the board of directors of Spar-Mica will be composed of three representatives each from Electro and Strategic.

The company will have the exclusive advantage of a new and unique feldspar processing method developed by Mr. Diamond. This process is believed to yield 50 per cent more glass spar concentrate than present upgrading methods.

Management of Spar-Mica will be provided by Electro. This company is a major supplier of refractory and abrasives materials to the ceramic industry which uses 90 per cent of all feldspar produced in the United States and Canada. Electro already has a Canadian plant at Cap de la Madeleine, Quebec, which is an important producer of silicon carbide.

The new Mattison Grinding Laboratory where manufacturers may bring their grinding problems for solution and recommendations.

Grinding Methods Laboratory Available to Manufacturers

The Mattison Machine Works, Rockford, Ill., introduces a new service to metalworking plants wishing to study production techniques: a Grinding Methods Laboratory equipped with major types of modern grinders for machining flat surfaces.

Manufacturers are encouraged to submit parts for sample grinds, production estimates, wheel recommendations, and other production requirements, and get answers based on close duplication of field conditions.

With so many variables in surface grinding and many potential grinding jobs still being processed by other metal removal and finishing methods and with appearance of finished surfaces becoming a more important factor in many industries, Mattison expects this new service will stimulate the trend toward surface grinding and reduce manufacturing costs. Also, it will permit demonstration of different grinding principles, such as multiple-pass and single-pass grinding, grinding on the face and periphery of the wheel, "shear-cut" grinding, crush grinding, continuous-feed grinding, etc. Grinding wheels, dressing techniques, and various relationships between the wheel and work travel may be altered to produce the best combination of accuracy, finish, and production.

- tolerances of less than half of one ten thousandths
- attaches to any grinder
- ready for traverse or plunge grinding in a few minutes
- no scratching or marring of workpiece
- used for tolerances as close as .00004 in. even while workpiece is vibrating and moving
- stable . . . freedom from drift

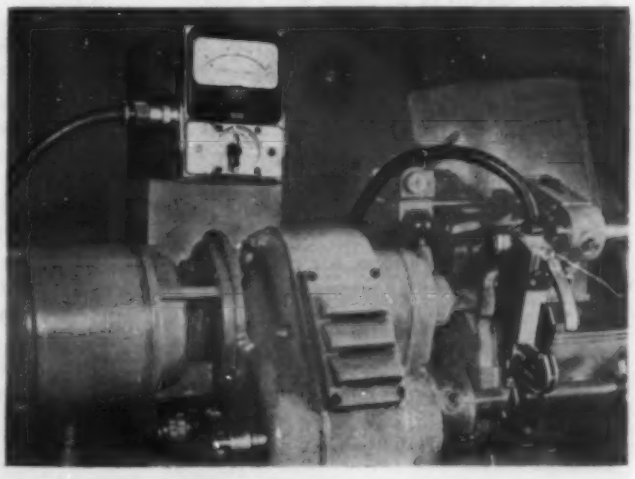
Automation for Manually Operated Grinders With New Electronic Gage

TOLERANCES of less than half of one ten thousandths can be guaranteed for any grinder with good centers by means of an electronic controlling attachment, which not only cuts down production and inspection costs, but provides precision automation even on manually operated grinders. The process called Electro-Autosizing has been carefully developed, electronically and mechanically, over a period of ten years by grinding and production experts. It comprises three major factors: (1) A highly stable and rugged contact gage; (2) a foolproof self-compensating electronic circuit with one or more stages of feedback; (3) cross-feed drive and rapid wheel return.

The gaging head is equipped with calipers for O.D. sizes from 1/16 in. to 6 in., freely adjustable and locking in less than one minute. There is no scratching or marring of the workpiece, even in soft materials. This is largely the result of careful shaping of the caliper, feather light pressure from the electronic sensing feeler, and an ingenious adjustable spring suspension system which is light and compact. It can be attached to any grinder and be ready for traverse or plunge grinding in a few minutes.

The changing size and taper of the workpiece causes a corresponding electronic signal to be transmitted by the gaging head through a five foot cable plugged into the amplifier and control unit. This portion is about the size and shape of a shoebox and can be placed anywhere within convenient vision of the operator. Whatever is taking place during grinding can be seen on its large electronic meter. This can be calibrated to maximum sensitivity of .000040 in. per division so that .0012 in. are blown

Typical toolroom application; automatically controlling the grinder. A series of plug gauges can be ground to various sizes in increments of .000050 in. by simply selecting with the knob. Taper and out-of-round can be spotted on the dial before the wheel automatically backs off at size.



up to a full scale deflection of approximately five inches. There is no flicker or flutter.

Under this meter is a radio type control knob used to set the control cut-off point for any one size. It is calibrated at .0001 in. per division and can be simply turned toward + or — the required number of divisions to determine the finished size of one or an infinite number of pieces. At cut-off point the meter indicator will be at zero and a red light will appear. The feedback leads assure simultaneous closing of a circuit at this point which interrupts grinding and returns the wheel.

Cleanup, "dwell" or "sparkout" has not been overlooked and can still be included without disturbing the guarantee of accuracy.

On grinders already equipped with automatic, or semi-automatic wheel-return, the Electro-Autosizer can be adapted for use in half-hour in most cases. On manual machines, it is only necessary to motorize the hand-feed wheel. This motorization can be supplied without significantly increasing cost. Regardless of the application, it has seldom been a difficult engineering problem and the machine can be used either manually or automatically with complete confidence and safety.

The set-up procedure can be done in three steps requiring a total of three minutes:

1. The operator closes and locks the caliper into contact with a model or sample piece.

2. Watching the meter, he then refines this adjustment with a half-turn of a knurled screw until the meter needle moves into scale range. He locks the screw.

3. For highest precision results, he then sets the work spindle in motion, and turns the radio type knob on the control box until the needle is on zero and the red light clicks on.

Once the above is accomplished, it is only necessary to load and unload pieces and initiate each cycle as usual with complete confidence that each piece will be exactly like the next. If a change of size or further adjustment is desired, it is only necessary to turn the control knob accordingly.

One of the most readily observed advantages of Electro-Autosizing is the new freedom from constant readjusting for wheelwear, changing hydraulic temperatures, and the complete independence from mechanical stops and positioning devices. The unit is manufactured by Electro-Autosizing Mach. Div., Industrial Gauges Corp., Englewood, N. J. ● ●

Suspension from wheel section permits precise taper indications. Unit impervious to water, dust, etc. Permits rough handling.

An ingenious adjustable spring suspension system prohibits scratching or marring the workpiece.

Special caliper for splines, flutes, or keyways.

By **J. T. Robertson,** Foreman
Small Tool and Cutter Grinding Dept.
Santa Monica Div., Douglas Aircraft Co.
Santa Monica, Calif.

Three Tool and Cutter Grinding Operations at Douglas Aircraft

AT THE Santa Monica Division of Douglas Aircraft Company we fabricate our own thread and plug gages; flat and circular form tools are made on micro-form grinders; contours and form milling cutters are fabricated and reworked on the latest contour grinders. We have equipment to handle milling cutters 30 inches in diameter and produce or resharpen a spiral cutter of any description, including carbide. At least 30 per cent of all of our grinding is performed with diamond grinding wheels.

- ✓ 30% of grinding done with diamond wheels
- ✓ designed special grinding machine with integral coolant system and eliminated a finger arrangement by installing a fixed leader
- ✓ reduced number of form tools by 35%
- ✓ made dressing attachment consisting of three diamonds mounted on separate arms with angular setting in each arm
- ✓ increased production 75% with this dressing attachment

Although we have modern equipment many problems arise due to materials and close tolerances maintained to build aircraft. Since this industry is comparatively new these problems are often solved by the "trial-and-error" method. A few of the problems we've encountered, and which we've solved, concern: (1) single flute high spiral router bits; (2) carbide form tools; (3) male dimple dies.

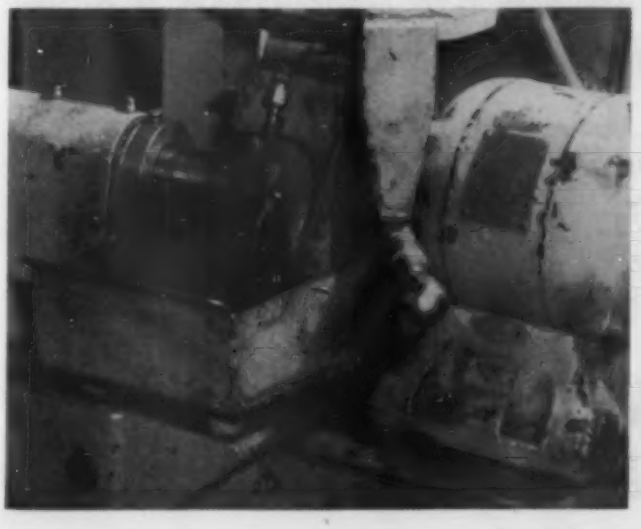
Single Flute High Spiral Router Bit

The single flute high spiral router bit originated as a suggestion by a Douglas employe who ground a two flute drill into a single flute tool to drill and rout with the same tool. Now the single flute high spiral router bit is produced by several leading tool manufacturers. The tool is designed and fabricated to drill through several thicknesses of Dural and then follow a template to rout contours, angles, and radii. The router bits are high speed steel single flutes and therefore have to be turned at a high rate of speed to maintain surface finishes. For many years this tool was ground dry with the use of a grinding finger, much the same as end mills are ground. The results were not very satisfactory due to grinding burns and lack of clearance which caused the cutters to fuse with the Dural and often break. This condition was corrected by designing a special grinding machine with an integral coolant system and eliminating the finger arrangement by installing a fixed leader. It was also necessary to change many clearance angles from the recommended manufacturer's specifications. Each time the tool is used it is cleaned by a strong caustic soda solution and then ground with a 60 grit grinding wheel to maintain a 20 microinch finish. This results in a very clean keen-cutting tool.

Grinding of Carbide Form Tools

Another problem that was solved was .106 in. half radii carbide form tools. This particular tool was designed to make hold-down rings for transport aircraft. These rings are made from 160,000 to 180,000 psi heat treated steel. The form tool itself was made from standard ½ x ½ carbide inserted tool bit stock. The original method of forming this small radii with clearance was performed by roughing in the radius with a hard grit silicon carbide grinding wheel and then finish with a formed diamond wheel. We found that this method would often result in cracked carbides. This problem was corrected by purchasing form carbide to within .005 in. of the desired radius. The soft metal was milled out and the carbide brazed in. It was a very simple matter to grind our formed radius with diamond wheel. This correction eliminated enough breakage to reduce the number of form tools required 35 per cent a month and saves approximately 20 man-hours each week.

This Douglas-designed router bit grinder has a fixed lead which permits the resharpening of high spiral single flute router bits.

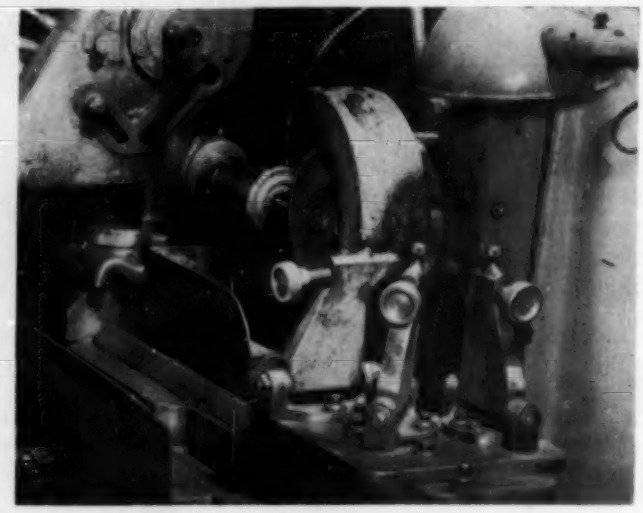


Male Dimple Dies

The reworking of male dimple dies has been a long and trying experience but the result is the present very simple operation. These dimple dies are used to form the angle for rivets to set in Dural skin and the dies vary from ½ in. to 1½ in. in diameter. The tolerance and finish are held very close particularly the finish requirement which is 8 microinch. There are four angles on these dies to be ground simultaneously to hold concentricity to .0002 f.i.r. reading. The angles that are ground are 3 degree pilot angle, 100 degree cone angle, 3 degree back angle, blending in with a 90 degree

A Douglas Santa Monica Division employe is shown using the Sheffield Micro-Form grinder to grind .106 in. radii into a formed carbide insert.

pad. It was our first thought to plunge grind all angles in one operation. This we accomplished by turning the spindle to desired angles and dressing the angular forms in the wheel. These dimensions were checked by using blanks and inspecting on a comparator. This method was very slow and it was impossible to keep up with the number of dies required for production.



This No. 13 Brown & Sharpe universal tool and cutter grinder has been converted so that it can grind male dimple dies in one operation.

A suggestion was made to fabricate a dressing attachment that consisted of 3 diamonds mounted on separate arms with angular settings on each arm. With the use of these three diamond dressers all the angles were dressed on the grinding wheel in one setting with the exception of the pad angle. The grinding of the pad angle was accomplished by swinging the table back 3 degrees and in this way grinding in the 90 degree angle without removing the dimple die from the collet. With this method of changing the table it enabled us to maintain all angles, finishes, and tolerance requirements in accordance with blueprint specifications and increased our production 75 per cent. ● ●

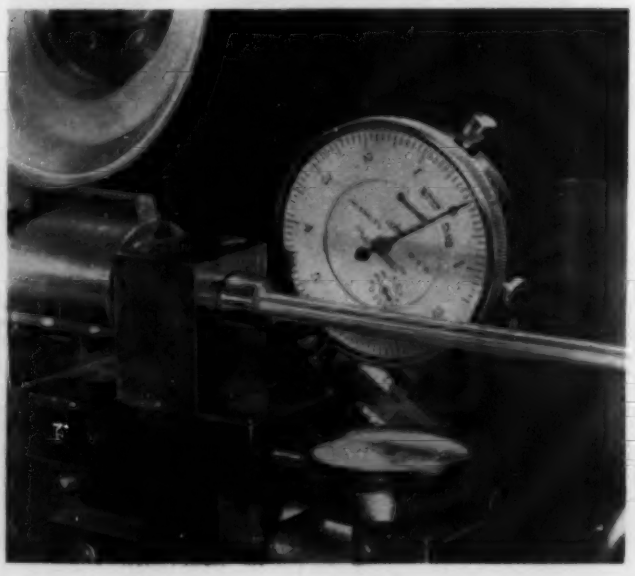
Grinding Special Thread Cutters

By combining unusual design features with cemented carbide, the screw machine unit of General Electric Company, Pittsfield, Mass., came up with a special thread cutter for making 11½-inch pitch pipe threads that cut an average of over 1000 linear feet of threads between grinds, or a total of 30,000 feet during the life of the cutter.

The cutter is used on a planetary thread miller in which the work is held stationary while the cutter is cycled automatically inside the work.

H-bond diamond wheels of Nos. 100 and 200 grit rough and finish grind the thread form. Cutting edge of the diamond wheel is dressed to correct tooth form in a small universal grinder, using a wheel turning at 5000 sfm, against the diamond wheel turning at 40 sfm.

Sine bar of General Electric grinding fixture used for grinding carbide inserted-tooth thread cutter. Note how gage block is used when stem reaches its limit, to permit grinding to be continued.



Wheel is mounted between specially designed aluminum flanges that extend out close to the cutting edge of the wheel. This provides a rigid construction, eliminating vibration and chatter, main factors preventing accurate, repetitive results.

The inserts are positioned for grinding the threads by means of a special fixture. A hand-rotated cylindrical insert holder, horizontal dial indicator and sine bar and vertical dial indicator included in the fixture greatly simplify thread grinding.

A slot in the cylindrical insert holder in which inserts are clamped is off-radius by the correct amount to produce the desired end relief on the individual teeth. The horizontal dial indicator is used to position the first tooth to be ground so all inserts in a set exactly duplicate each other.

Precision lead spacing feature of grinding fixture.

100% more pieces per grind
300% less tools required per job
400% savings in monthly tool cost

the superiority of ELOX electrical discharge grinding was proved by this large automotive company's unsolicited 2-month comparison report!**

Tool Name, Description:	Solid Carbide Insert	
Part Name:	Crankshaft	
Operation Name:	Finish Front & Rear Thrust Bearings	
	Standard Grind	Elox EDM Grind
TOTAL PIECES PER TOOL	17,290	95,904
MINUTES PER GRIND	21.0	13.75
COST PER GRIND	$ 1.26	$ .83
ESTIMATED MONTHLY TOOL COST	$294.71	$92.19

in writing **Elox will guarantee increased tool productivity over any type of abrasive grinding.**

Other Elox equipment available to remove broken taps, drills, etc., from $495 to $3450.

elox* corporation of michigan

****Comprehensive report and company name given on request.**
***T. M. Reg.**

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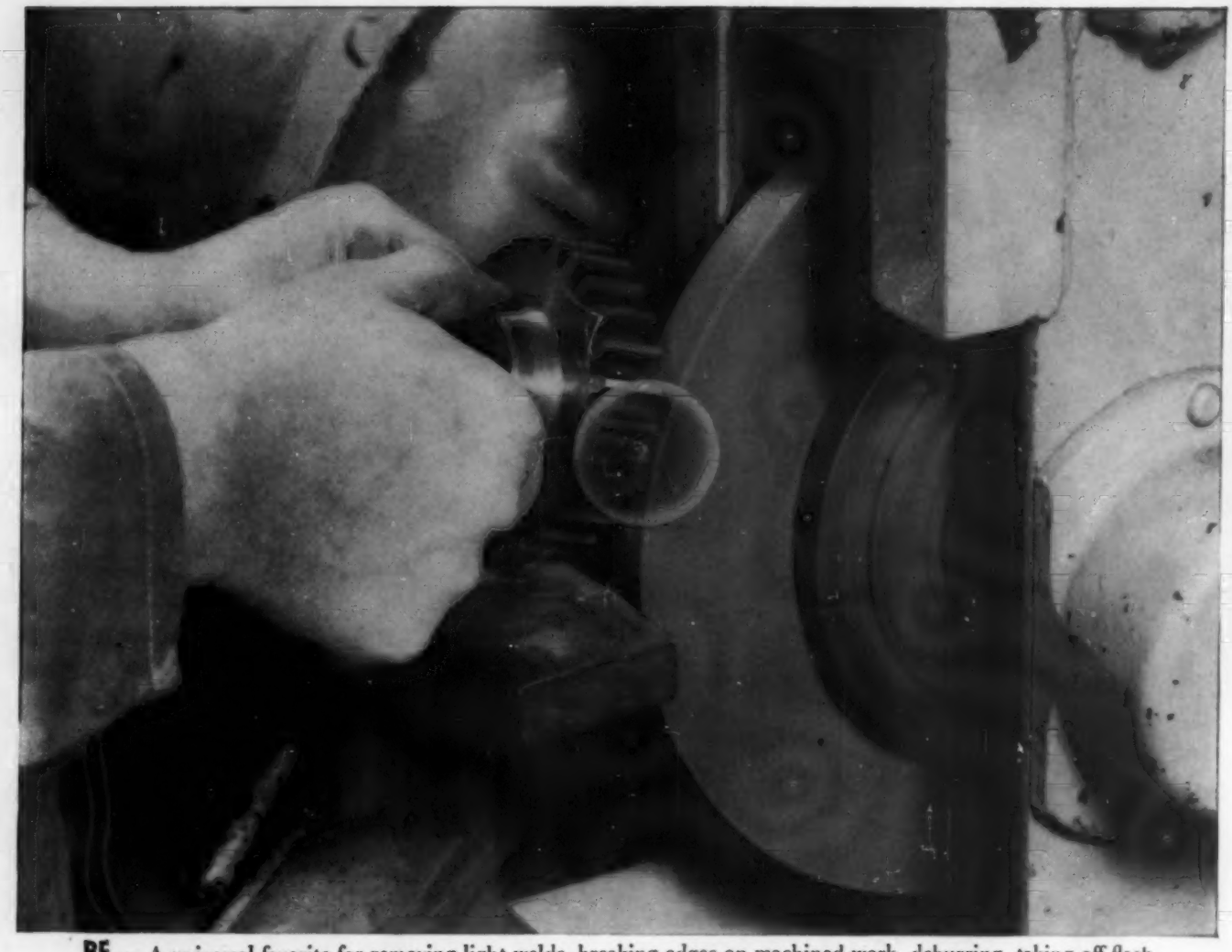
Encircle No. A1 on card, opposite Page 68



BF — A universal favorite for removing light welds, breaking edges on machined work, deburring, taking off flash from plastic parts and many other light portable and bench grinding operations. To be used on periphery only.

The jobs they do!...The money they save!

Norton Reinforced Wheels add the "TOUCH of GOLD" that cuts time and costs on countless everyday grinding jobs

You get *more* than 100 cents' worth of usefulness for every dollar you spend on Norton Reinforced Wheels.

You get extra-long service life, exceptional strength and fast, cool, trouble-free grinding — the Norton-engineered "Touch of Gold" that saves you money in the widest range of routine grinding jobs, from light deburring to heavy cutting-off.

To this top grinding performance Norton Reinforced Wheels add a wide margin of safety. All four are resinoid bonded and reinforced by layers of tough fabric molded into them. As follows:

BF — *Semi-flexible straight wheel, cotton fabric reinforcement. Also available in mounted wheels and points and hand sticks.*

BN — *Straight wheel with glass cloth reinforcement. Primarily a cut-off wheel, its rough knurled sides provide additional cutting action.*

BD — *Rigid hub-type. Glass cloth and Nylon reinforcement. Designed especially for right angle portables and disc sanders.*

BFR — *Semi-flexible hub-type. Cotton fabric and Nylon reinforcement.*

See Your Norton Distributor

for a demonstration of Norton Reinforced Wheels in your shop, on the jobs you're doing every day. Ask him for the new, 34-page illustrated catalog on Reinforced Wheels. Or write to NORTON COMPANY, Worcester 6, Mass. Distributors in all principal cities, listed under "Grinding Wheels" in your phone book, yellow pages. *Export:* Norton Behr-Manning Overseas Incorporated, Worcester 6, Massachusetts.

BN — The preferred cut-off wheel for non-ferrous and non-metallic jobs. Also excellent for cutting wire rope, slotting rails, tuck pointing etc. Used on swing-frame and stationary cutting-off machines, large and small portables.

BD — A specialist in heavier stock removal, such as welds on fabricated work, smoothing flame-cut edges, cleaning between teeth of gear castings, etc. — also for slotting, notching and cutting-off.

BF — **Mounted Wheels and Points** have the same strong laminated construction as the larger BF wheels. For polishing die cavities, chamfering, Brinell spotting, etc. For hand finishing, use BF sticks.

BFR — Excels at the lighter portable jobs, such as rust and scale removal, light weld grinding, scarfing and beveling, blending contours, notching gates and risers.

W-1636

NORTON

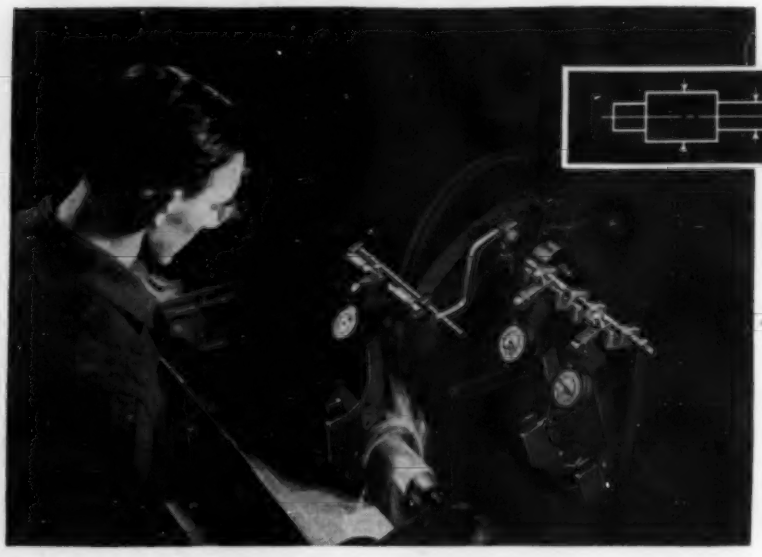
Making better products... to make your products better

and its BEHR-MANNING division

NORTON COMPANY: Abrasives • Grinding Wheels • Grinding Machines • Refractories
BEHR-MANNING DIVISION: Coated Abrasives • Sharpening Stones • Pressure Sensitive Tapes

Encircle No. A2 on card, opposite Page 68

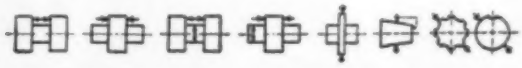
for either mass or short run grinding the ARNOLD GAGE can do a better job



faster —

one or several diameters on same set-up

Faster than snap gages and more accurate, too. No stopping grinder to gage. You see the diameter of the work all the time *as it grinds.* Various gage setups available (see below). Overgrinding is eliminated. Less scrap. No grinder should be without this gage.



Any of these dimensional requirements, and more, can be gaged with simple gage set-ups to suit.

and more ***positively***

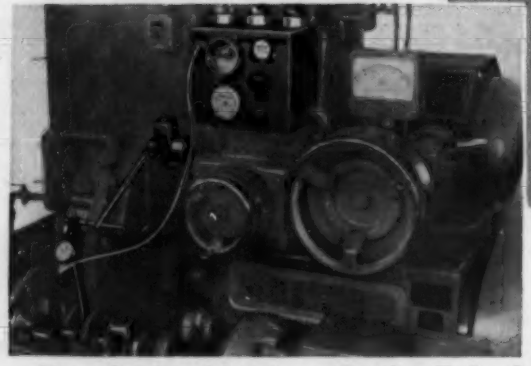
with the

ARNOLDAIR

The Arnoldair smooths out the vibration and reading oscillations. Users report they can split tenths easily and repeatedly. Gives the operator even greater assurance of accuracy and increases his production. Illustration shows two-dimension Arnoldair applied with Federal Dual Dimensionair.

also applied to

MACHINE CONTROL



Here the Arnoldair is used with a Federal Automatic Air Switch for automatic control of grinding machine.

Send for — Complete Catalog

FEDERAL PRODUCTS CORP.
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Ask **FEDERAL**

FOR ANYTHING IN MODERN GAGES . . .

Dial Indicating, Air, Electric, or Electronic — for Inspecting, Measuring, Sorting, or Automation Gaging

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The sine bar and vertical dial indicator is employed to indicate the advance of the insert holder needed when changing the grinding position from one tooth to the next. Sine bar angle is such that tooth spacing is indicated by an exact multiple of one revolution of the indicator needle. The dial is calibrated in tenths of a thousandth, and the indicator stem has sufficient range for about 1/3rd the number of teeth in an insert. When the stem reaches its limit, a gage block is inserted, as shown in accompanying view, after which the grinding operation is continued.

The same method is used when resharpening inserts. Because of the way wear occurs on the teeth, the method requires less removal of material than face or flute grinding. Actually, about 30 radial regrinds can be made during the life of the inserts, rather than eight to ten maximum by the face grinding method. Cutters are used until wear amounts to 0.0025-inch, and then about 0.003-inch of material is removed.

The accuracy resulting from using the fixture is considerably within accepted tolerances. Tooth spacing is held to .0001 in. between any two adjacent teeth, and .0002 in. between any two teeth in the 1¼ in. width of the insert. Tooth form of 60 degrees is held within 5 minutes. ● ●

NO MORE COPING WHEEL RETURNS!

Bullard does away with the old-fashioned wheel return nuisance — the Bullard "Safe-Center" Coping Wheel is simply discarded when worn out. The old style heavy steel center is eliminated — construction is stronger, yet 50% lighter weight. Bullard molds this wheel as a complete unit by a special process — the center is rigid — the wheel has twice the usual cutting material. No danger of breaking or chipping of face — saves up to 50% operating costs.

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BULLARD Geo. H. Bullard COMPANY INCORPORATED

HOPKINTON ROAD WESTBORO, MASSACHUSETTS

SPECIALTY MANUFACTURERS OF RESINOID BONDED HIGH SPEED GRINDING, CUT-OFF AND COPING WHEELS

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Announcing the NEW HANCHETT

MODEL SK-24

SLITTER KNIFE GRINDER for Top or Bottom SLITTERS WET GRIND

- *finest finishes*
- *extreme accuracy*
- *rigid construction*
- *capacity 3" to 24" diameter*
- *semi or fully automatic*
- *positive and accurate fixturing*

HANCHETT MANUFACTURING COMPANY

World's Largest Manufacturer of Knife Grinding and Saw Sharpening Machinery

MAIN OFFICE — Big Rapids, Michigan WEST COAST — Portland 1, Oregon

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Shop Hints and Short Cuts

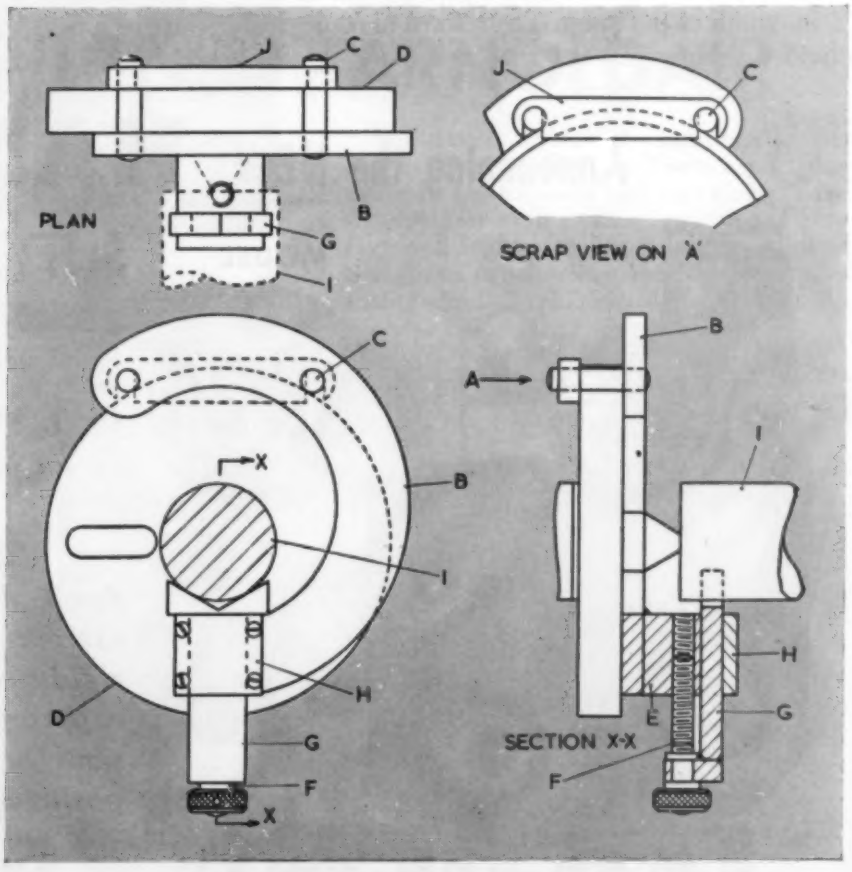
Aid for Center Loading

By **Jordan Perivale**

LOADING long shafts between lathe or grinder centers is usually a two-handed job for which the machine operator has to request assistance from another person.

A grinder or lathe operator can usually manage a short shaft single-handed. He engages the headstock center with the hole in the work and holds it there by pushing the component axially while he engages the tailstock center. Sometimes, the component is just too long or heavy for the operator to control by himself with the result that the headstock center becomes disengaged and the component is dropped onto the machine with probable damage to both.

In order to eliminate the need for a helper and to avoid damage to work and machine, a support for the loading of work between machine centers was designed and made and very good results were obtained by its use. The purpose of the support is to hold the work in contact with the headstock center of the machine while the operator concentrates his energy and atten-



Do you use short cuts in your work? Do you have any kinks which would be helpful to the next fellow? Send them to GRINDING and FINISHING for publication. All material is paid for! Material can be in your own words, drawings can be rough pencil sketches; our editorial and art departments will do the rest. Send your Hints and Kinks to: Editor, GRINDING and FINISHING, 222 E. Willow Ave., Wheaton, Ill.

tion on the tailstock center.

The support comprises a C-shaped piece of flat steel **B** at the upper end of which are a pair of supporting pins **C**. The peripheries of the pins make contact with the outside diameter of the work driver plate **D** and serve the dual purposes supporting the weight of the C-shaped piece and centralizing the bottom end of the piece.

At the lower end of the C-shaped piece is welded a block **E** which is drilled and tapped to accommodate the elevating screw **F** which raises or lowers the V-plate **G**. The V-plate is made from a piece of flat steel and slides vertically in a slot milled in the block **E** where it is retained in place by means of the keep plate **H**. By rotating the elevating screw, the V-plate is adjusted vertically to suit various work diameters **I** and align them with the machine centers. As illustrated, the V-plate is in its lowest position for accommodating the largest work diameter to be done on this particular machine.

To prevent the C-shaped piece from falling away from the machine's work-driver plate, a simple locking plate **J** is provided. The slots in this locking plate engage with a flat filed into the periphery of each supporting pin **C** so that the locking plate is simply dropped into place on the pins. The locking plate is in contact with the back edge of the work piece driver plate, as shown in the scrap view **A**.

In use, the work supporter is placed on the work driver plate and the V-plate is set to the correct height. The height setting need not be made with any great accuracy as the centers will engage themselves provided that the V-plate is set so that the center hole is a fraction below the machine center line. The operator places the left hand end of the component in the V whereupon it is a simple matter for him to support the right hand end with one hand while he operates the tailstock center with the other.

Before grinding or turning can commence, the work supporter must be detached. This is done by lifting up the locking plate out of engagement with the supporting pins when the work support may be removed from the machine very easily.

It is usual practice with our operators to slide the work-driving dog on to the component before mounting in the machine. After the work is on the centers and the support has been removed, the driving dog can be adjusted for position and locked to the work. The support is also used for unloading the work, in which case, it is already in position for loading the next piece. • •

Adjustable Diamond Dresser for Surface Grinders

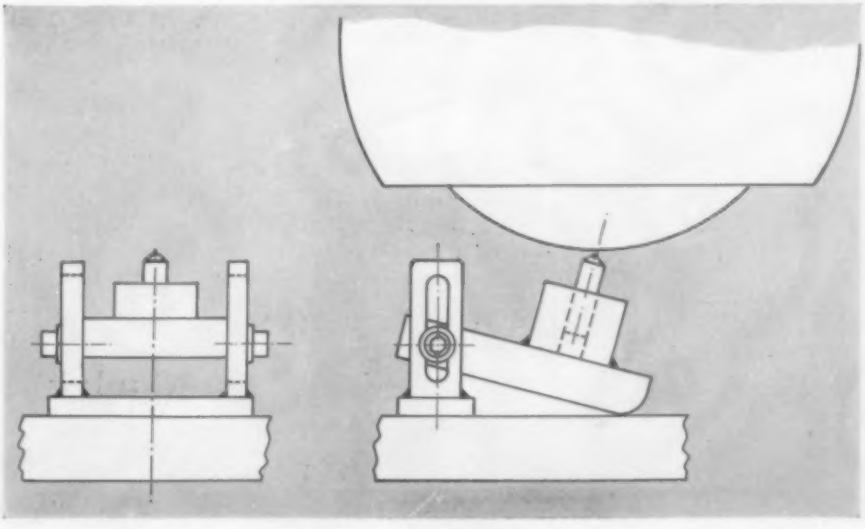
By **L. A. Roberts**

The conventional type of diamond dresser (a plate with a vertically positioned diamond) frequently does not give satisfactory diamond economy as diamonds must be reset too often. Some improvement was made when the carrier plate was designed so that the diamond nib was at an angle out of the vertical position. Rotating the nib then prolonged diamond life.

A still better solution is pictured here where the angle of the nib is adjustable by means of a simple bracket.

The adjustable bracket consists of a base plate to which two vertically slotted bars are welded. This bracket is held fast by the magnetic chuck. The dresser holder is drilled and tapped for two lock screws. Also, one edge of the dresser holder is rounded to allow good contact with the magnetic chuck in various positions.

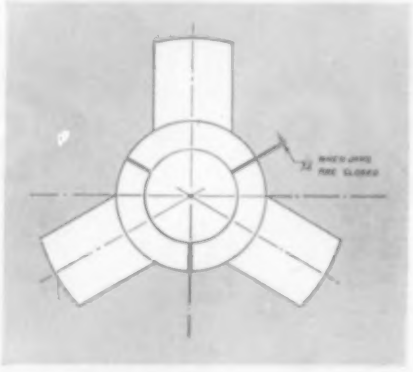
It can be seen clearly that, because of this adjustability, many positions of the diamond relative to the wheel can be obtained. Faster and more accurate dressing and greater diamond economy will be the result. • •



Split ring aids internal grinding

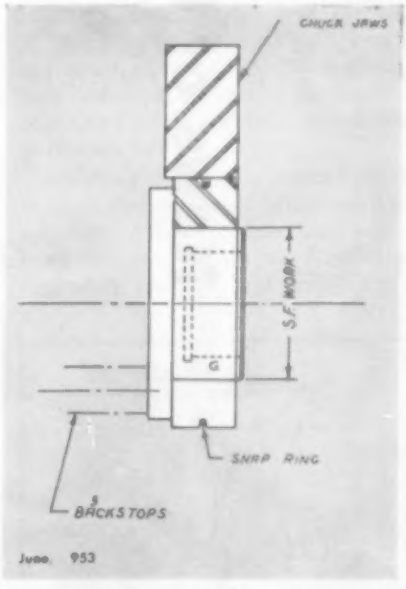
By **Roger Isetts**

During internal grinding of flanged bushings and similar parts such as the one shown that require concentricity with the o.d., the parts cannot usually be chucked directly because of the limited jaw movement of most air operated chucks. The illustrated setup solves this problem, yet is inexpensive



to make and will maintain a high degree of accuracy.

A tool steel ring is hardened and the i.d. ground to a snug slip fit with the part. The o.d. of the ring is ground concentrically with the i.d. The ring is then split into three equal sections



with a rubber wheel. The three pieces are then held together with a snap ring. In use, the chuck jaws themselves are ground in the machine they are to be used on to fit the o.d. of the ring. This guarantees accuracy. The ring is slipped over the work and the clamping pressure of the jaws on the ring will hold the work securely in place. • •

1955 Machine Tool Show At Chicago Sept. 6-17th

MORE than 325 exhibitors will display machine tools and accessories at the National Machine Tool Show and the Production Engineering Show to be held in Chicago from September 6 to 17, inclusive.

The Machine Tool Show will be held at the International Amphitheatre while the Production Engineering Show will be staged at Navy Pier.

In conjunction with the Machine Tool and Production Engineering Shows, a third show, known as the Coliseum show, also will be held. It is here that equipment and accessories not displayed at the other two shows will be exhibited.

Exhibits at the Machine Tool Show will be confined entirely to machine tools with the exception of the trade press. The Production Engineering Show will display mechanisms, instruments and equipment that contribute to greater automaticity of industry production and processing. This equipment will include electronic devices, air gages, conveyors, brakes, clutches, drive mechanisms, chucks, lubricating systems and grinding wheels and attachments.

To house the Machine Tool Show, a new extension with 188,000 square feet of floor space is being added to the International Amphitheatre. With the Amphitheatre's 240,000 square feet, this gives the Machine Tool Show a total floor area of 428,000 square feet.

While substantially less than the combined area of the 1947 show in the Dodge Chicago plant, the 1955 Show constitutes the largest available floor space in the country practicable for the

The Chicago Museum of Natural History at Burnham Park, an extension of Grant Park. The museum is noted for its collection of authentic settings of wild life in their natural habitat. Skeletons of prehistoric monsters, Egyptian burial vaults and Viking ships are attractions.

Also among Chicago's museums is the Museum of Science and Industry in Jackson Park which houses, among other things, a coal mine complete with shafts, track and train.

exhibit of machine tools.

Many new grinding, lapping and honing machines will be shown at the Machine Tool Show and other branches of the abrasive industry have a wide selection of exhibits planned for the Production Engineering Show.

The display space will be comprised of the following areas:

1. The amphitheatre arena in the center of the building;
2. The north and south halls on either side of the arena;
3. The north and south halls on the second floor;
4. The new exposition Hall, on the ground floor.

Ample power will be provided by a new high tension line from the Central Manufacturing District power plant. The total connected horsepower will be about 60,000 KVA, the largest load of any building in the world, and special transformers and lines will be installed to carry it.

A depressed railroad side track has been built, 451 feet long, in the new Exposition Hall, which will accommodate 10 railroad cars at one time. Machines can thus be unloaded from railroad cars directly onto the exposition floor. At the south end of the Exposition Hall there will be a truck platform which will accommodate five trucks simultaneously, also providing for unloading directly onto the exposition floor. It is estimated that 300 railroad cars and 1000 trucks will be required to bring the exhibitors' machine tools to the Show.

Visitors will enter by ramp or stairs to large registration booths on the second floor, where they will register and receive a badge. Admission will be by registration only. Show hours will be 10:00 a.m. to 5:30 p.m. daily. It will not be open on Sundays.

A variety of services, including checkroom, telephones, a messenger service maintained by the American Machine Tool Distributors' Association, an information booth, a Post Office, a telegraph office, a travel bureau with airline and railroad ticket offices, a housing bureau, and a free interpretation service, will be located in the registration area.

There will also be an internal communications system with overhead wires which transmit messages from the Show office to tiny pocket receiving sets carried by floor managers, who can then go to a telephone and call back.

Lunch stands will be scattered throughout all of the show areas, and, adjacent to the arena is a large sized cafeteria. In the auditorium there are two lunch rooms seating 300. In addition, the Show will enjoy the entire facilities of the Stockyards Inn, next to the auditorium, including the famous Sirloin Room, the Matador Room, and the Stockyards Cafeteria.

Visitors may reach the Show from the Loop area by Show bus, by taxicab, by elevated railway, or by surface car. Travelling time is about 20 minutes.

The Amphitheatre is located between Halsted Street and Dexter Park Avenue, and Exchange Place and 43rd Place. All buses and cabs will go to the Dexter Park side, and visitors should also go to that side as that is where parking facilities have been provided. Visitors arriving by surface or elevated car will use he Halsted Street side.

More than 10,000 rooms have been reserved in Chicago hotels for Machine Tool Show visitors. Visitors will consist chiefly of top executives of manufacturing companies, vice-presidents in charge of operation, production executives, plant managers, engineers, designers, and men engaged in research and product development. It is estimated that at least 200,000 men in these classifications will attend the SHOW.

Ex-Cello-O Acquires Michigan Tool

The acquisition of Michigan Tool Co. by the Ex-Cell-O Corp. has been announced. Michigan Tool operates three plants in Michigan, and a subsidiary, Colonial Tool Co., in Windsor, Ont. Michigan Tool will continue to operate as a separate unit under its present management.

The board of directors of Ex-Cell-O has been enlarged from seven to nine members, with the newly created positions being filled by the appointments of Oscar L. Bard, president of Michigan Tool, and Earl E. Conlin, secretary and treasurer of Ex-Cell-O.

Bryant Chucking Grinder Buys High Production Machine Co.

Bryant Chucking Grinder Co. of Springfield, Vt., recently announced purchase of the High Production Machine Co. of Philadelphia, Pa., by the E. G. Staude Manufacturing Co. of St. Paul, Minn., a wholly-owned subsidiary of Bryant.

The High Production Machine Co. manufactures set-up paper box machinery and an acetate boxmaking machine while Staude has manufactured a wide line of folding paper box machinery and special packaging machinery.

All future manufacturing and engineering for both companies will be conducted at the Staude plant in St. Paul, Minn. Arrangements have been made for a systematic transfer of inventory, complete engineering facilities and experienced personnel to the Staude plant.

Dr. M. E. Merchant

Receives Outstanding Engineer Award

Dr. M. Eugene Merchant, assistant director of research of the Cincinnati Milling Machine Co., was the recipient of the 6th annual Outstanding Engineer Award, presented by the Technical and Scientific Societies Council of Cincinnati. The award was presented in recognition of his original research in friction, lubrication and metal cutting.

The recipient of this award is chosen from among 6,000 members of the affiliated technical societies on the basis of their contributions to scientific, engineering, or technical knowledge; their contribution to the development of the profession; and their contribution to human welfare.

Merchant has been a member of the research department of Cincinnati Milling since 1936. He was president of the American Society of Lubrication Engineers for the year 1952-53.

"A guy can't be too careful, what with all the pickpockets we've had around the plant lately."

Delpark to Sell Olson Pressure Type Filters

In a combined announcement, George L. Guymon, Vice-President of Industrial Filtration Company, distributors of Delpark Industrial Filters and R. E. Mitchell, Vice-President, Olson Filtration Engineers, Inc., Chicago, announce the signing of an exclusive franchise, authorizing Delpark to handle sales for the Olson Pressure type filters in the metalworking and industrial fields.

The Olson Filter uses the precoat principle by coating screen type tubular elements with diatomaceous earth. The liquid passes through the earth into the tubular screen and is pumped back into the system.

Automatic cleaning is accomplished in 1 to 3 minutes by back washing. Filter cake and sludge are knocked from the elements and drop to a cone within the filter. An agitator prevents packing and removes the sludge. Precoating is again started and the cleaning cycle is completed.

New Super Tool Plant

Opening of a new 20,000 square feet plant at Elk Rapids, Mich., has been announced by Super Tool Co., Detroit. Construction of the new plant expands the company's production of standard carbide drills, reamers, milling cutters, saws, lathe tools and other metal cutting tools.

In addition, the company has recently built a factory branch and warehouse at Glendale, Calif., and warehouses at New York and Chicago.

American Chain & Cable Acquires Allison Company

Officials of the American Chain and Cable Co. Inc., of Bridgeport, Conn., have announced the purchase of the Allison Co., Bridgeport, Conn., which has specialized in the manufacture of abrasive cutting wheels.

Officials stated that combining the Allison Company acquisition with the Campbell Machine Division of American Chain and Cable will permit rapid and orderly development of both machines and wheels.

The Allison Company will continue to operate at its plant on Island Brook Ave., Bridgeport. Hugh V. Allison will continue in his present capacity as its president, and the other members of its management will continue in their present positions.

Carborundum Launches Employee Suggestion Contest

Fifty-five hundred non-supervisory Carborundum Company employees stepped into the role of management consultants recently with the official launching of a new idea contest in all United States and Canadian plants and subsidiaries of the Company. Grand prize in the contest will be a new automobile; second prize is a room-full of furniture worth $1200; third prize, stove and refrigerator. Alternate cash prizes of $2,000, $1,000 and $500 have been listed, and during the 4-month course of the contest, various merchandise prizes will be awarded to stimulate interest and encourage competition. The contest will run from April 1 to July 31.

Employees received official news of the contest in personal letters written by Company President, Clinton F. Robinson. Contest judges include: I. Wendell Hamm, Director of Manufacturing; F. Jerome Tone, Jr., Senior Vice President; Harry C. Martin, Vice President, Research & Development; and E. B. Forse, Vice President, retired.

The primary purpose and objective of the contest is to find employee-suggested methods for increasing production, improving customer service, and economizing costs.

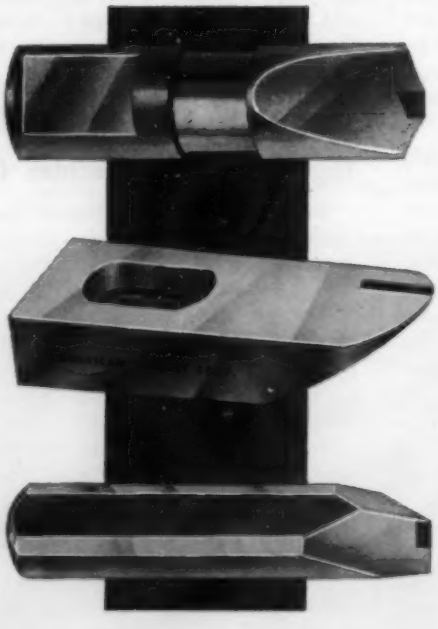
In addition to the employee prizes, prize vacation trips will be awarded the three supervisors who rate the highest on a point system based on the quality and quantity of suggestions from their departments.

Merchandise prizes will also be awarded during the contest.

The grand prize winners will be announced on or before October 15. They will be chosen on a basis of the reduction in costs that Management is able to obtain from the submitted idea, or the value of the idea with respect to a new product or a new use of a present product.

Super Tool Plant at Elk Rapids, Mich.

SHAPED DIAMOND TOOLS



25 years ago accuracies of more than .002 inch were exceptional. Today, every diamond tipped shaped tool manufactured by the American Coldset Corporation is guaranteed to have—

- **Diamond radius as specified and concentric within .0001 inch.**
- **Centerline of radius and locating flats co-linear within .0005 inch.**
- **Matched tools with corresponding dimensions similar within ± .0002 inch.**

COLDSET

American Coldset Corp. 87-89 Court Street Paterson 3, New Jersey

Encircle No. 233 on card opposite Page 68

Henry R. Merrill

E. D. Porter

J. Zach Higgs

APPOINTMENTS & PROMOTIONS

Henry R. Merrill has been appointed general sales manager of the Behr-Manning Division of Norton Company. Mr. Merrill, a director of Behr-Manning and its assistant general sales manager for the past two years, succeeds the late John M. Cook.

He joined Behr-Manning's Customer Service department in 1930, and has been employed since 1934 in field selling operations for the Troy, N.Y. manufacturer of coated abrasives and pressure-sensitive tapes. He was made manager of the Cleveland division in 1937, became assistant industrial trades manager in 1941 and was promoted to industrial trades manager the following year.

He was elected to the Behr-Manning directorate last year. He has served on the Behr-Manning operating board since 1951, and as a director of the Norton Pike Company since 1946.

Edward D. Porter and **J. Zach Higgs** have been appointed manager and superintendent respectively of the new electric furnace plant which Norton Company is building at Huntsville, Ala. Completion of the $1,285,000 plant is expected by January 1, 1956.

Mr. Porter has been with the Norton Research and Development department at the Chippawa, Ontario, electric furnace plant since 1948. He has been actively engaged in research and development of MAGNORITE magnesium oxide, CRYSTOLON silicon carbide, fused Dolomite, and special electrical insulating refractories. These are among the products which will be manufactured at the Alabama plant.

Here's an interesting study of why many manufacturers are now using the new multiple pole Power-Grip Chuck to increase grinding production. Installation of a new Power-Grip Chuck provided 40% more holding area than was possible with the equipment of the same size formerly used. In the illustration above the lightened area shows the increase in the work holding capacity of the Sundstrand Chuck.

The illustration to the left shows the closely spaced pole separations which are of .050" wide brass separated by a ⅛" wide mild steel spacer. This design feature coupled with the unusual efficiency of Sundstrand low voltage winding gives uniform holding power over the entire face of the chuck.

Free Data

Write for new magnetic chuck bulletin — contains useful information on this and other Power-Grip Chucks. Ask for bulletin 456M.

SUNDSTRAND POWER-GRIP

SUNDSTRAND
Magnetic Products Co.
Division of Sundstrand Machine Tool Co.
1020-9th ST. • ROCKFORD, ILLINOIS

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Clare F. Saltz

Frank J. Hoder, Jr.

Floran L. Meacham

Clare F. Saltz has been appointed manager of the ordnance equipment division of the U. S. Hoffman Machinery Corp., according to Revis L. Stephenson, vice-president. Mr. Saltz is a graduate of the University of Michigan where he majored in explosives.

In conjunction with the name change of Micro-Precision, Inc. to Micro-Precision Division of Micromatic Hone Corp., Evanston, Ill., **Frank J. Hoder, Jr.** was named General Manager, it was announced from the Micromatic office in Detroit.

Paul B. Brown, president of Sterling Grinding Wheel Co., Tiffin, O., and the Peninsular Grinding Wheel Division of Abrasive Metal Products Company, Detroit, has announced recent changes and appointments in the executive staff of both organizations. These are as follows:

Harold E. Erf as manager of sales administration, Sterling.

O. J. Lautermilch as manager of sales engineering, Sterling.

Frank O. Klapp as advertising and public relations manager, Sterling and Peninsular.

The Simonds Worden White Company of Dayton, O., has announced the election of **Floran L. Meacham** as president and general manager. **H. R. Simonds** was elected chairman of the board and **Dr. Frank R. Henry** was named vice-chairman. Mr. Meacham comes to Simonds Worden White from the Avco Manufacturing Corp., where he served as general works manager in charge of all manufacturing operations at the Crosley Bendix Home Appliance Division. He is the third president of the company which has been operating continuously for 80 years.

Joseph S. Imirie, formerly assistant to the president, has been named general manager of the Carborundum Company's new Electric Minerals Division. Other key promotions in the new division were: **George R. Rayner, Jr.,** sales manager; **D. George Vanderhoek,** manufacturing manager; **Joseph J. Forrester,** manager of product engineering; **Harold L. Schmidt,** works manager of the Niagara plant of the new division; and **Elmer E. Howard,** manager of the Vancouver plant.

Don S. Connor has been named general manager of Micromatic Hone Corp., Detroit. Executive vice-president of the company since 1945, Mr. Connor will retain that title in addition to his new position. This and two other management appointments were announced by Kirke W. Connor, company president.

William H. Harris, Jr., becomes vice-president and assistant general manager, and **R. G. Ellis** becomes the company's new chief engineer.

The coolant stinks, eh?

Well, don't dump it!

We'll kill that odor with the new powder-additive: **Rance-RID**

IT'S A SERIOUS COST-PROBLEM:

Metalworking plants are pouring coolant and labor dollars down the drain. The reason: coolant turns rancid.

RANCE-RID SOLVES THE PROBLEM:

It restores *the original condition* of the oil emulsion. It smells, looks, and *is* like new. No masking odors are used . . . Use it in central-type coolant systems, or in individual machines. Treat the same coolant over and over again!

TRY RANCE-RID—AT OUR EXPENSE:

That sounds generous. Actually, it isn't. Rance-Rid sales have been built on *one-ounce samples. Just one ounce treats 20 gallons* of soluble oil emulsion . . . Try it—at no cost. Your inquiry brings the sample.

HERSEN CHEMICAL CO.
825-P FISHER BLDG., DETROIT 2, MICH.

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Gene R. Voigt

Laurence G. Holfelder

James A. Coleman

Donald A. Kilb has been appointed district representative for Hammond Machinery Builders, Inc., Kalamazoo, Mich. He will have headquarters in Cleveland, and will represent the company for their line of carbide grinders, abrasive belt grinders, polishing and buffing lathes and dust collectors.

The Aro Equipment Corp., Bryan, O., has appointed **Gene R. Voigt** as assistant to the general manager of the Air Tool Division. He will be responsible for helping promote increased sales of the company's air tools, hoists and air equipment accessories.

Two new abrasive engineers and a new field engineer have been named by Norton Co., Worcester, Mass. **Laurence G. Holfelder** has been assigned to the central Indiana territory. **James A. Coleman** will cover the Kansas City territory, and **Raymond B. Goodale** has been appointed a field engineer at the company's Chicago district office. All are former members of the sales engineering department.

Machinery Associates, Inc. of Wynnewood, Pennsylvania, has been appointed exclusive representative in Washington, D.C. for the Grinding Machine Division.

They will continue to represent Norton in the Philadelphia area. Under the new arrangement, they will handle both commercial and United States Government business in the Capital.

Appointment of **Ralph R. Baldenhofer** as director, Metalworking Equipment Division, Business and Defense Administration, at Washington, D.C., has recently taken effect. Mr. Baldenhofer is treasurer of the Thompson Grinder Co., of Springfield, O., and is on leave for this government post.

Oliver A. Gottschalk, formerly assistant controller of the Carborundum Co., has been appointed assistant to the president. Mr. Gottschalk will assist the president in the general management of the business, conduct special investigations and studies and make recommendations on company policy.

Richard Prouty became secretary succeeding **Malcolm Pilsworth,** who has retired.

Fairman C. Cowan was elected clerk of the corporation, succeeding Mr. Pilsworth. He was appointed assistant secretary and general counsel.

George Jeppson was re-elected chairman of the board and **Milton P. Higgins** re-elected president by the directors.

The **S-22 MICROFINISH COMPARATOR**

GAGE SURFACE FINISH TO NEW A.S.A. STANDARDS - *Quickly - Accurately*

This convenient pocket comparator has 22 precision surfaces for specifying and controlling finish to the new A.S.A. Standard B46.1 - 1955. Electroformed in durable corrision-resistant nickel, the S-22 Comparator provides every department with the most inexpensive method for uniform, accurate control of finish characteristics.

Save valuable time in engineering, inspection, quality control — eliminate costly overfinishing in purchasing and production. $15.00 complete with leather case.

Available from leading industrial distributors, or write

BAPTIST MACHINE CO.

39 Ludlow Street, Stamford, Conn.

Encircle No. 216 on card opposite Page 68

After more than 25 years service in various production roles at both Clark Township and Harrison, N.J. plants of Hyatt Bearings Division, General Motors Corp., **Edward K. Fiebelkorn** has entered private business as a consultant to general industry on grinding problems. Mr Fiebelkorn has gathered wide experience while serving other manufacturing companies including his own, the Progressive Machine & Tool Co. His offices are located at 74 Trinity Place, New York City, and 42 Blackburne Terrace, West Orange, N.J.

J. F. D. Rohrbach, president of Raybestos-Manhattan, Inc., announced the following elective appointments made at the Board of Directors meeting:

S. R. Zimmerman, Jr., vice-president; **R. J. Gorecki,** director; **H. H. Burrows,** vice-president of Rubber sales; and **R. B. Hazard,** sales manager of the rubber and packing divisions.

A new service devoted exclusively to consulting engineering in diamond truing and dressing has been announced by Fred M. Bley, engineering consultant, who for many years has combined scientific and practical knowledge in the field of industrial diamond engineering.

From 1928 to recent years, Mr. Bley has manufactured a wide variety of industrial diamond products. He was active in design, research, development, diamond selecting, and diamond buying.

He is a well-known inventor in the diamond tool industry and has played a leading part in the development of precision products, including circular and reciprocating diamond saw teeth, diamond core drills, and standard and specialized diamond truing and dressing tools.

Mr. Bley, having realized the immense need within the diamond industry for educational programs and the need of proper application to yield efficient results from costly raw diamond material, will devote himself exclusively to consulting engineering in diamond truing and dressing.

His office is located at P.O. Box 66, Valparaiso, Ind. Telephone number is Valparaiso 34-0-34.

Fred M. Bley

Handsome and Sharp! Students at the customer grinding course, held at Norton Co., Worcester, May, 1955.

First row, left to right—D. B. Wills, Instructor, Norton School of Grinding; Peter J. Sommer, Size Control Co.; P. R. Getchel, Baldwin-Lima-Hamilton Corp.; Anthony Montelbano, American Airlines; Donald P. LaTessa, Thompson Products; Thomas H. Kimes, Allegheny Ludlum Steel Co.; Charles A. McQuarrie, General Electric Co., Everett, Mass. and R. B. Ryder, General Electric Co., West Lynn, Mass.

Second row, left to right—Marty N. Micomonaco and Felix E. Rosinski, SKF Industries; Chester Kohl, Goss Printing Press Company; Willard E. Percy, Panama Canal Co., Balboa Heights, Canal Zone and Wilmer W. Strauss, Ford Motor Co.

Third row, left to right—J. A. Burgoon, Baldwin-Lima-Hamilton Corp.; E. O. Alcock, Newport News Shipbuilding & Dry Dock Co.; Donald G. Judd, Webster Manufacturing, Inc.; Harold D. Dolan, Ford Motor Co., and William V. Kratt, Jr., Wm. Kratt Co.

TECHNICAL SALES ENGINEER
Precision Barrel Finishing Equipment

Live in Southern California—the land of progress and opportunity . . . L.A. territory open for man capable of earning $10,000 to $15,000 a year on Salary-plus basis. Wonderful opportunity with manufacturer of the most complete and advanced line of barrel finishing equipment. At least 3 years of sales and engineering experience on barrel finishing and procedures is required. Give full business and personal background, salary desired in first letter.

WRITE BOX No. 2
GRINDING & FINISHING
WHEATON, ILLINOIS

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PROCESS ENGINEER
Precision Barrel Finishing Equipment

Live in Southern California—the land of progress and opportunity. Position open with Los Angeles manufacturer making the world's most complete and advanced line of barrel finishing equipment. Opening in barrel finishing processing and development department. Advancement opportunities for sharp, aggressive young man. Degree NOT necessary but at least 4 years experience in barrel finishing procedures, media, compounds, etc. is required. Give full business and personal background—salary desired, first letter.

WRITE BOX No. 1
GRINDING & FINISHING
WHEATON, ILLINOIS

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BETTER CUT WITH
BEAVER CUT CARBIDE

Cushion Ground and Micro-Lapped Rotary Files, Grinding Burrs, and Center Lapping Tools outlast regular ground carbide tools by 30% yet cost no more.

You may make a greater saving by sending us your dull tools for sharpening by our manufacturing method.

Beaver Cut Rotary File Company
401 E. Slauson Ave.
Los Angeles 11, Calif.

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Available Literature

Catalogs and Bulletins Available from Manufacturers

For copies of the literature in which you have an interest use the postage-paid postcard. Merely circle the identifying number and mail the postcard.

1. Wheel Dressers. Illustrated literature showing 6 models of Fluidmotion wheel dressers and one model of Form-Master with full specifications and operating instructions is available from J & S Tool Company, Inc., 880 Dorsa Ave., Livingston, N. J. Fluidmotion dressers will form dress wheels ranging from the smallest sizes to those of 24" in diameter on internal, cylindrical, surface, and tool and cutter grinders and will accomplish the form dressing of 2 angles, 2 radii and one flat tangent in one setting it is claimed.

2. Impregnated Diamond Wheels, Drills, Dressers. Catalog DT 353, issued by Fish-Schurman Corp., Dept. GF, 81 Portman Rd., New Rochelle, N. Y., gives complete description and prices of "Steelset" impregnated diamond wheels, drills and dressers. An illustrated index, operating instructions for core drills and coolant feeds, and for disintegrating core drills, and suggestions for use of twist drills are included in catalog.

3. Abrasive Belt Machining. The application methods of the complete line of Porter-Cable abrasive belt machines are described in detail in a new catalog announced by the Engelberg Huller Co., Inc., Dept. GL, 325 Seneca St., Syracuse, N. Y. The operation of the five types of abrasive belt machining is also explained in the catalog and many case histories are given.

4. Oilstone Grinders. The Plurality oilstone grinder, manufactured in three models by the Mummert-Dixon Co., 128 Philadelphia St., Hanover, Pa., is five basic units in one: coarse oilstone wheel, fine oilstone wheel, grinding cone, leather stropping wheel, emery wheel. Bulletin No. 2851 gives complete descriptions and includes a knife grinding attachment and a saw gumming attachment.

5. "Automatic Electrolytic Shaping With Electronic Control" is the title of a brochure offered by the Anocut Engineering Co., Dept. GL, 631 W. Washington St., Chicago 6, Ill. Describing what the Anocut automatic supply unit does, the brochure goes on to describe the Model 103 which is designed for simple connection to any standard grinding machine—for face grinding, surface grinding, cutter grinding, etc. Carbide tools, special alloy steels, titanium alloys and many other hard-to-grind materials can be ground on this unit.

6. Rods, Blocks, Discs & Wheels. Catalog No. 58, issued by Brightboy Industrial Div., Weldon Roberts Rubber Co., 95 No. 13th St., Newark 7, N. J., lists their entire line of rubber-cushioned abrasives for a wide variety of finishing on all metals, plastics, wood, glass and laminated materials. Available in many sizes of either aluminum oxide or silicon carbide grains.

7. Wheel Dresser. The Jeon Model P-1 automatic angle tangent to radius dresser will dress a radius to .0001" and angles absolutely tangent to a split sec-

ond in one continuous operation, it is claimed. Dresser is described and illustrated in a folder available from the Jeon Mfg. Co., Dept. GF, P. O. Box 6750, Washington 20, D. C. A flyer showing several of the profiles which can be obtained is also available.

8. Surface Grinding Machines. The significance of the slow and fast cross feed when surface grinding with a cup wheel and the cross feed on ELB surface grinding machines are features of a booklet available from Columbia International Corp., Dept. GF, 10-35 44th Dr., Long Island City 1, N. Y. Specifications, controls, design, and standard and extra equipment are also included in booklet.

9. Optical and Diamond Wheels. Precision Diamond Tool Co., Dept. GL, Elgin, Ill., has issued Catalog No. 3-54 on metal and resinoid bonded diamond wheels and hones, and Catalog No. 4-154 on steel bonded diamond wheels for grinding precision optics. Diamond wheel catalog lists all standard sizes of diamond grinding wheels manufactured by company and is also intended as a reference engineering data book.

10. Care of Grinding Wheels. A well-illustrated booklet issued by the Sterling Abrasives Div., Dept. GF, Cleveland Quarries Co., Tiffin, Ohio, describes in pictures and captions the importance of the proper care of grinding wheels. Several things to do and several things not to do in handling, moving, storing, etc. are outlined. Some solutions for your grinding problems and new Sterling grinding items are also included.

11. Straight Edges, etc. Dovetail straight edges, parallel and bridge-type straight edges, semi steel surface and layout plates (with or without stands) are described in detail in a folder issued by Willison & Theemling Rebuilding Co., Dept. GL, 790 E. Washington Blvd., Los Angeles 21, Calif. The new Dovetail straight edge, principally designed to reach the vital dovetail areas where accuracy is so important, is featured in this folder.

12. Liquid Honing. Complete details on their VB Liquid Honing process can be obtained from the Vapor Blast Mfg. Co., 3033 W. Atkinson Ave., Milwaukee 16, Wis. Process can be used in a wide variety of applications in the aircraft, automotive, machine tool, instrument and jewelry industries, and in practically all metal-working, plastics, rubber or glass plants.

13. Rotary Files, Chatterless Countersinks, and high speed cutting tools are described in folders available from Beaver Cut Rotary File Co., 402 Slauson Ave., Los Angeles 11, Calif. Carbide files are cushion ground and company has always used a setup in grinding burrs where the tool is cushioned in a non-rigid manner in contact with the grinding wheel. This eliminates high heat and coolant it is claimed.

14. Wet Surface Grinder. The Model 1000 universal wet surface grinder manufactured by the Peterson Welding Labs., Inc., Dept. GF, 1423 Virginia Ave., Kansas City, Mo., is designed for grinding heads, manifolds, and blocks from both in-line and V-8 type motors of all sizes from the No. 13000 series caterpillar down. Maximum workpiece size is 16" wide x 64" long x 24" high. Centrifugal force flush coolant system permits a .010 depth of cut. Catalog No. 1955 available from company.

15. "Air Tools." Abrasive tools, including straight grinders, die grinders, small wheel grinders, grinders and sanders, and grinding wheels are among the many items illustrated and described in Catalog No. 564 issued by Chicago Pneumatic Tool Co., Dept. G, 6 East 44th St., New York 17, N. Y. 140-page catalog also includes impact wrenches, screwdrivers and nut runners, drills, hammers, etc. and gives operating recommendations.

16. Coolant Filters. Delpark coolant filters, offered as optional equipment on all models of Gardner double spindle grinders and Micromatic Microhoning and Microflat equipment, are described with the various machines in two folders available from Industrial Filtration Co., Dept. GL, Lebanon, Ind. Folders also explain how the Delpark filter operates.

NEW
A BIG ADVANCE IN BELT SANDERS
WALLS
TU-WAY BELT SANDER
USE IT EITHER WAY
HORIZONTAL
VERTICAL
It takes the leader to show the way! The new WALLS 'TU-WAY' BELT SANDER offers all the most wanted features yet sells for such a low price.
It's a rugged industrial sander of top quality throughout. Try it—see if you don't agree that it's the BIGGEST SANDER VALUE YET!
Check These WALLS TU-WAY Advantages:
Instantly adjustable from horizontal to vertical and back again. Simply loosen one nut. No time lost.
Swift action thumb screw for instant belt adjustment.
Extra fast, easy belt changing.
Balanced aluminum pulleys for smoother operation and longer life.
Full ½ h.p. G. E. motor.
Permanently sealed bearings require no lubrication.
Outboard bearing arm takes up overhang on drive pulley.
Center leg eliminates strain in horizontal position.
Large work table with mitre gauge slot for use in vertical position . . . available at slight additional cost.
WALLS TU-WAY BELT SANDER
Complete with cord, plug and "on-off" switch . . . ready to plug in and use. Only
$89.95
Illustrated Literature on Request
A few desirable distributor territories still available.
WALLS SALES CORPORATION
333 NASSAU AVENUE BROOKLYN 22, N. Y.

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17. Surface Grinder No. 1224 is described in bulletin from Abrasive Machine Tool Co., 36 Dunellen Rd., East Providence, R. I. This unit is one of the Hydrabrasive line known for accuracy and performance. Grinder has a hydraulic feed. Specs. are 12″ x 24″ x 12″. Complete information available.

18. Semi-Automatic Internal Grinder is available in either 12″ or 24″ table travel. Automatic sizing unit sufficiently versatile for production of one or many parts. Automatic spindle in-feed—cam actuated. Bulletin gives complete specifications, photos, etc. Write Parker-Majestic, Inc., 147 Jos. Campau Ave., Detroit 7, Mich.

19. Magnetic Chucks discussed in Handbook published by Taft-Peirce Mfg. Co., Woonsocket, R.I. Handbook discusses broad line of electromagnetic and permanent magnetic chucks. Available in all standard sizes and models and designs: swivel, tilting; fine mesh; longitudinal pole chucks, etc.

20. Precision Laboratory Grinder for close tolerance grinding in experimental or short run production work can be used for external, internal, surface, special form, optical profile, spherical, radius and tool grinding. Has built-in dust exhaust system, built-in dial indicator and an integral vibration damper. Has compound grinding head and universal indexing workhead. Write for catalog: Jungner Tools, Div., Nife Inc., Copiague, L.I., N.Y.

21. Pressure Blast Wet Blasting is described in literature available from The Cro-Plate Co., Inc., 747-D Windsor St., Hartford 5, Conn. Wet blasting is claimed to cut down sanding and buffing time. Blends directional grind lines and smooths belt lines. It imparts directional finishes and provides semi-reflective surface.

22. New Centerless is described in Catalog G-640, published by Cincinnati Grinders, Inc., Cincinnati, Ohio. Catalog describes the grinding of small parts, up to ½ in. in dia. Machine has 5 hp motor; Filmatic bearings; double side construction between bed and regulating wheel; automatic and oil-shot lubrication. Photos, specifications.

23. New Wheel for Tool & Cutter and Surface Grinding is discussed in folder from Precision Grinding Wheel Co., Philadelphia 36, Pa. Wheel is claimed to cut faster and freer, is sharper for heavier cuts, holds its shape longer, reduces grinding costs. Illustrations, specs.

24. Super Precision Surface Grinder, Model 2F, has hardened and ground cross slide ways completely sealed; one shot lubrication; hardened and ground anti-friction vertical slide; 3600/1800 rpm., 2-speed wheel head; heavy alloy steel spindle runs in super precision ball bearings; preloaded. Bulletin available from The Thompson Grinder Co., Springfield, Ohio.

25. "On-The-Job" Engineering Service is available from Bay State Abrasive Products Co., Westboro, Mass. Available through local distributors or from Bay State engineers to help solve your grinding problems.

26. Pope Precision Spindles are made to super-precision tolerances; have radial and axial rigidity; shafts are large for extra rigidity and have excess capacity; special system of grease lubrication permits no internal clearance for oil film in the bearings—none is required. Discussed in literature available from Pope Machinery Corp., 261 River St., Haverhill, Mass.

27. "What's New in Roll Lapping?" Spitfire Tool Co., Dept. GF, 2931 N. Pulaski Rd., Chicago 41, Ill., has issued a new 3-color bulletin covering their precision roller lapping machine "12." The bulletin is designed to enable the reader to get facts without having to wade through wordy build-up paragraphs. It is a veritable encyclopedia on roller lapping.

28. Cutter Grinding Aids. Ingersoll Milling Machine Co., Dept. GF, Rockford, Ill., has issued a new 52-page booklet which describes recommended cutter grinds for different materials, types of cuts and quality of finish required. It is also a handy reference for tool grinders and machine shop supervisors, and presents information and drawings on 14 basic grinds.

Valve Manufacturers
NEED
Precision Flatness and Finish . . .
Agitator tank keeps abrasive and vehicle in proper suspension
Solenoid valve controls correct flow of abrasive
Abrasive mixture flows down feed track
Mixture is evenly distributed over lap plate by rotating conditioning rings
Conditioning rings keep lap plate flat automatically
Conditioning rings serve as standard workholder
Spent mixture drains off through serrations in lap plate

(micro-inch finishes of 2 to 3 RMS—surface flatness to less than .000011" when required) is being definitely achieved on all materials including cast iron, steel, stainless steel, magnesium, aluminum, brass, carbon, ceramics, plastics and sintered metals. It will pay you to investigate this modern precision, yet economical, method of machining.

A great many valve manufacturers are included in the more than 500 producers of industrial equipment using Lapmasters. All have found this machine to be the answer to obtaining precision flatness, finish and parallelity in production quantities. Types of valves include gate, slide, hydraulic, solenoid, rotary, diaphragm, etc. The high production accuracy of the Lapmaster

Get all the facts

Here are three booklets that will give you the facts on producing and measuring precision flatness and finish. Write for your copies today.

Crane Packing Co., 1812 Cuyler Ave., Chicago 13, Ill.
In Canada: Crane Packing Co., Ltd., 617 Parkdale Ave., N., Hamilton, Ont., Canada

Lapmaster DIVISION — CRANE PACKING COMPANY — 38 YEARS INDUSTRIAL PROGRESS

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29. Cutting and Grinding Fluids. A new booklet from S. C. Johnson and Son, Inc., Dept. GF, Racine, Wis., describes advantages of wax in metalworking and gives the comparative machinability rating of various steel grades.

30. Spindles. The Whitnon Manufacturing Co., Dept. GF, 217 High St., New Britain, Conn., has issued a new 2-page folder describing the Whitnon Spindles for new or rebuilt surface grinders. Folder is illustrated and includes high cycle applications, external grinding, tool and cutter grinder and special applications.

31. Honing Machines. A booklet containing typical applications from plants that have used Sunnen honing machines in production, tool room, maintenance, and salvage is obtainable upon request from Sunnen Products Co., Dept. GF, 7938 Manchester Ave., St. Louis 17, Mo. Machines are used mostly for metalworking applications, in sizing and finishing internal diameters, but they are equally useful for work in plastics, ceramics and glass.

32. Diamond Products. Catalog No. 102, the United Diamond Tool Corp., Dept. GF, 51 Prospect Ave., Lynbrook, N.Y., presents the most recent information on diamond tools and diamond wheels manufactured by the company. Covered are: diamond wheel dressers, forming and radius tools, special tools, thread grinders, diamond abrasive compounds and diamond wheels.

33. Universal Cutter and Reamer Grinders for grinding clearances on cutters and reamers, straight or spiral flute, shank or arbor type, cemented carbide or high speed steel are discussed in bulletin issued by the Union Twist Drill Co., Dept. GF, Athol, Mass.

34. Diamond Wheels. Action Diamond Tool Co., Dept. GF, 4545 W. Grand Ave., Chicago 39, Ill., has issued a 44-page catalog describing its complete line of Jetaline and RoBot Resin diamond wheels. The former used with a coolant will cut in carbides depths up to ⅛" in a single pass. The RoBot Resin has a new bond that is said to have a longer life. Use a factory letterhead.

35. Flute Grinders. Issuance of a new eight-page bulletin on flute grinding has been announced by Edward Blake Co., Dept. GF, 440 Cherry St., West Newton 65, Mass. The company's standard machine will handle right and left hand taps from smallest to ⅜" dia. with 2, 3, or 4 flutes. Large capacity workhead is available for handling 4-flute right hand taps having shank dia. up to 1⅜", or body dia. up to 2".

36. Electrical Discharge Grinding, Machining. Three bulletins have been prepared by the engineering staff of the Elox Corp. of Michigan, Dept. GF, 740 N. Rochester Rd., Clawson, Mich. Bulletin No. 5 discusses the Elox process of electrical discharge grinding. No. 6 tells of wheel erosion and dressing in electrical discharge grinding. Bulletin No. 7 reports on electrodes used with the Elox process of electrical discharge machining.

37. Rotary Tools and Grinders. A 38-page booklet cataloging the products of the Metal Removal Co., Dept. GF, 1546 N. Orleans St., Chicago 10, Ill., has recently been issued. Grinding wheels, abrasive specialties, carbide burrs, end mills are presented. Photographs illustrate items in use.

38. Grinding Wheels. Rubber-bonded centerless grinding wheels are described in a bulletin being distributed by the Manhattan Rubber Div., Raybestos-Manhattan Inc., Dept. GF, Passaic, N.J. In most cases roughing and finishing operation may be done with the same wheel.

39. Hydraulic Grinder. Rivett Lathe & Grinder, Inc., Dept. GF, 18 Riverview Rd., Brighton 35, Boston, Mass., has prepared a 16-page catalog describing its Model 1024 internal and universal hydraulic grinder. Featured is the double-end wheelhead, which swings 180° for internal and external grinding.

40. Grinding Machines. Catalog AG describes the line of automatic precision rotary and surface grinding machines manufactured by the Standard

FULMER HONING MACHINES

FOR ACCURATELY FINISHED INTERNAL BORES

up to 36 inch diameter in 30 feet long cylinders

FROM small diameter bores to huge cylinders it's all the same to Fulmer Honing Machine. In one continuous operation irregularities of internal bores are cut away and the bores finished perfectly. Shown in this "official U.S. Navy" photo is one of the largest honing machines ever built.

Tolerances can be produced as close as .0001 (±). Machines are ruggedly constructed and engineered to handle greater than normal loads and assure low upkeep under the most severe operating conditions.

WRITE FOR OUR BULLETIN ON HONING.

C. ALLEN FULMER CO.

1246 First National Bank Bldg. Cincinnati 2, Ohio

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Electrical Tool Co., Dept. GF, 2486 River Rd., Cincinnati 4, O. Solutions to actual grinding problems are illustrated, showing specific applications for each model machine.

41. "Facts About Zirconium" is a concise compilation of information about the history and production of zirconium. The mechanical and physical properties, chemical properties, facts about fabrication of zirconium, such as melting, forging, rolling, welding, machinability, are discussed. The Carborundum Metals Co., Inc., Dept. GF, Niagara Falls, N.Y.

42. Slide-Honing. Metals, plastics, castings and parts previously considered impractical to finish in tumbling machines are now successfully handled according to an illustrated folder from BMT Manufacturing Corp., Dept. GF, 110 E. 9th St., Elmira Heights, N.Y.

43. "Eye Savers." A revised catalog released by the Watchemoket Optical Co., Dept. GF, 232 W. Exchange St., Providence 3, R.I., contains many new developments in eye protective equipment. A soft vinyl cover goggle introduces an entirely new principle in goggle ventilation called "Stac-Vent." Light and comfortable safety spectacles called "Visor-Tucs" which provide almost complete protection even from heavy impact hazards, and "Tuc-Overs" a new type of safety clip-on are among the new developments.

44. New Grinding Coolant. Leaflet describes Triple C Grinding Coolant produced by Motch & Merryweather Machinery Co., Dept. GF, 1250 E. 222nd St., Cleveland 17, Ohio. Company claims coolant has no emulsifying action on oils or any deterrent effect on lubricated parts of machine; heat is dissipated and maximum cooling attained.

45. Mounted Wheels & Mounted Points. Full color codes of Jarvex mounted wheels and mounted points are contained in 12-page catalog from Charles L. Jarvis Co., Dept. GF, Middletown, Conn. Color code for wheels and points includes steel, steel castings, ductile iron, cast iron, carbides, glass and nonmetallic grades.

46. Cutter Grinder. Brochure covering newly patented Weydemann & Hasselkus universal tool grinding machine available from Marac Machinery Corp., Dept. GF, 45 S. Broadway, Yonkers, N.Y. This cutter grinder is for grinding milling cutter clearances by direct angular setting. Spindle swings about center of cutter and leaves a stronger tooth because clearance is not hollow. Diagrams and specifications are included.

47. Diamond Grinding Wheels & Hones. Catalog No. 1233, containing an assortment of standard sizes of grinding wheels and hones, is available from Norton Co., 20 New Bond St., Worcester 6, Mass. Included in tables of 52-page booklet is net price of items listed in various ordering quantities. Information on diamond wheel markings, selection of wheels, standard shapes of wheels, and suggestions on use of diamond wheels and hones is included.

48. Gear Lapping Problems and solutions are offered in a 8-page bulletin by Michigan Tool Co., Dept. GF, 7171 E. McNichols Rd., Detroit 12, Mich. Also presents a concise explanation of lapping process. Two external and two internal gear lapping machines are illustrated and their features, specifications and capacities are described.

49. Magnetic and Fabric Filter. Sixteen-page bulletin illustrates and describes Kleenall combination magnetic and fabric filter, utilizing the practicability and low maintenance requirements of separation by permanent magnetic field

the right dresser for

EVERY WHEEL

Only Desmond can furnish you with the correct dresser for each type grinding wheel. Some are shown above, left to right:

For large coarse wheels—the Desmond Heavy Duty, in two sizes.

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Also—Desmond Hex, Desmond Rearwin, Desmond Sherman, Desmond Diamo-Carbo, Desmond diamond nibs for all makes of grinders, Desmond Crackerjack—and special dressers and cutters for unusual applications.

Write for new Desmond Dresser Catalog, and name of your nearest Industrial Distributor.

THE ONLY COMPLETE LINE OF GRINDING WHEEL DRESSERS AND CUTTERS

Desmond

THE DESMOND-STEPHAN MFG. CO., URBANA, OHIO

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and cleaning by filtration through preselected fabric medium. Laboratory facilities, application, engineering, and testing services are available to help solve coolant cleaning problems large and small. Available from Barnes Drill Co., Filtration Div., Dept. GF, 852 Chestnut St., Rockford, Ill.

50. Optical Form Grinder Projector-Comparator. Bulletin from Portman Instrument Co., Dept. GF, New Rochelle, N.Y., describes new Portman Model OFG-200 Optical Form Grinder Projector-Comparator. This dual purpose instrument has been designed so that it may be used on most standard precision surface grinders of either 6x18", or 8x24" size. Bulletin includes specifications, illustrations and diagrams.

51. Water-Mix Cutting & Grinding Fluids Guide is available from D. A. Stuart Oil Co., 2749 S. Troy St., Chicago 23, Ill. The guide is intended as a help in selecting a water-mix. It also provides information and background on water-mixes generally.

52. "Safety Hints in Grinding" is a new pocket-size booklet from Besly-Wells Corp., Dept. GF, 20 N. Wacker Dr., Chicago 6, Ill. The "wrong" and "right" ways to test, mount and use grinding wheels and discs with the greatest safety are presented in a humorous style.

53. Precision Tumbling. Three folders from Miller Machine Tool & Gauge Shop, Dept. GF, 3613 San Fernando Rd., Glendale 4, Calif., are titled: Reduce Production Costs 80%; Media and Compounds; Outstanding features of the Most Modern Barrel Finishing Equipment. Folders also cover specifications and illustrations of company's Speed-D-Burr tumbling barrels and equipment.

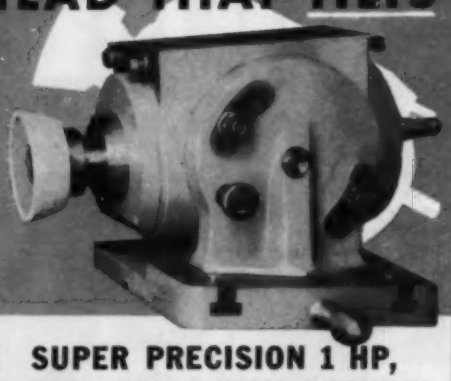
54. Honing Machines for honing internal bores up to 30" diameter and with strokes from 12" to 144", for ferrous and non-ferrous metals, glass, plastic and other materials, are described in a bulletin issued by C. Allen Fulmer Co., 1246 First National Bank Bldg., Cincinnati 2, Ohio. Machines are built in five basic sizes, each size available in various stroke lengths. A bulletin on piston ring lappers, obtainable in air or hydraulic models, which company claims simplify aircraft engine overhauling, eliminate guesswork in fitting piston rings, save tearing down engines because rings don't seal properly, is also available.

55. Grinders, Buffers, Dust Collectors. A new 48-page catalog issued by Cincinnati Electrical Tool Co., 2690 Madison Rd., Cincinnati 8, Ohio, gives complete data on their line of grinders, including angle plate, bench and pedestal type, disc, drill, snagging, tool post and many others; bench and pedestal buffers; dust collectors; speed lathes; and various attachments and accessories. Specifications, photographs and diagrams.

Use the *handy reply cards* opposite page 68 to obtain free literature offered on these pages. Circle the identifying number and mail the postcard.

HERE'S A HEAD THAT TILTS

and Yours Will Nod, Too When You See What You Can Do With This One



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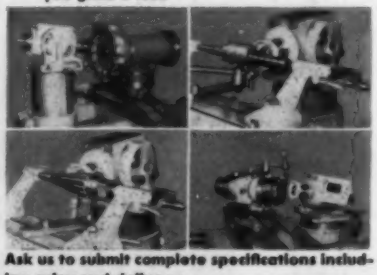
With Angular Adjustment In A Vertical Plane

Give this versatile head the nod and save time and money these seven ways:

1. You can use cup wheels for practically all clearance angles and thus produce a cutting edge on tools that lasts longer because it is stronger.
2. You can keep the tooth rest on the center line of the cutter for practically all grinding on centers or in the work head.
3. You can grind most cutters and reamers all over with a single set-up using the swivelling table and Pope tilting head.
4. You can read all clearance angles directly in degrees from the scale provided on the head. No more mistakes.
5. You can get the right clearance angle on such tough grinding jobs as slab mills, taper reamers, angular cutters and form tools.
6. You have one safe speed — 3600 RPM — for all wheels generally used on cutter grinders. Heat checking of cutters is virtually eliminated.
7. You have a head that's so easy to adjust and use it saves you time and money every time you grind a tool.



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No. 101

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POPE MACHINERY CORPORATION

Established 1920

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What's New in Equipment and Materials

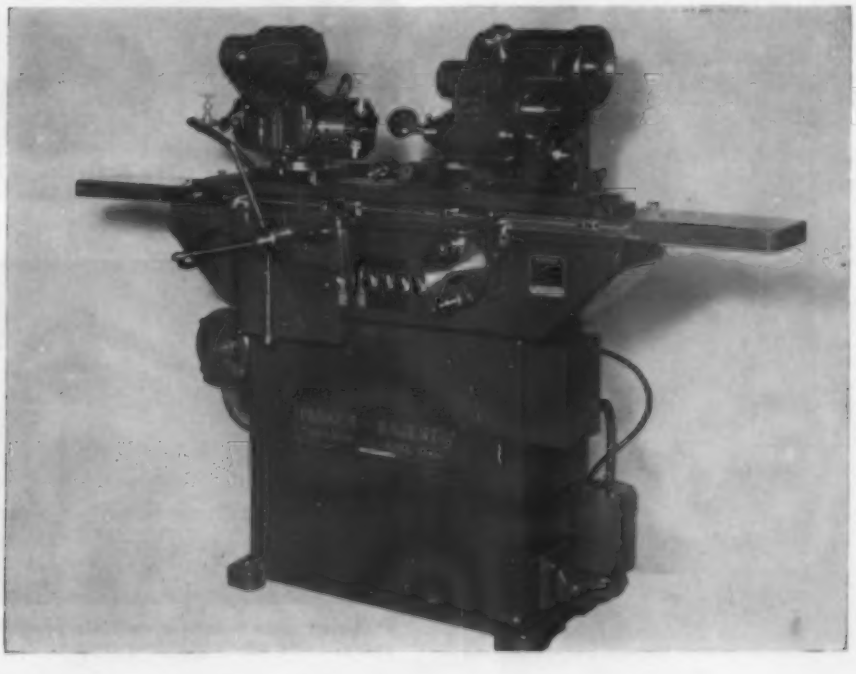
Semi-Automatic Grinder for Precision Sizing

Parker-Majestic Inc., 147 Jos. Campau Ave., Detroit 7, Mich., has developed a semi-automatic internal machine which can be used either as a conventional internal grinder or for automatic operation. Two models of this grinder, both having a 10″ swing over the table, are available. The first has a table travel of 12″ and the second a table travel of 24″.

Three methods of energizing the table travel are available as standard equipment on all machines. The first is Hand Feed which is used for manual operation. The second is Power Feed which is a gear and rack actuated table movement, electro-mechanically controlled by means of a limit switch. Four rates of speed are available; i.e., 12, 24, 36 and 48 inches per minute. The final method of actuating the table is by means of the Reciprocator, a lever arm mechanism. This enables a table stroke from 0 to 3″. The rates of reciprocation are 30, 50, 75 and 100 strokes per minute.

The standard in-feed is the conventional handwheel, lead screw and nut. The handwheel proper is graduated in thousandth increments and attached thereto is an auxiliary control accurately graduated in tenths.

In automatic operation a cam controls the in-feed. The grinding spindle is mounted in a hinge type bracket and as the cam rotates the grinding wheel is fed into the work. A carefully planned cycle of operation insures extreme repetitive accuracy. In this cycle provisions have been made for loading, rough grinding, wheel dressing and finish grinding. When finish size has



been attained a dwell period provides "spark out" time, the result of which is better finish and size control.

Spindle in-feed is a direct function of table reciprocations. A ratchet mounted on the cam shaft is energized with each stroke of the table thus imparting rotational movement to the cam. This movement can be adjusted from 1½ to 12° per table stroke.

An especially designed wheel dresser contributes greatly in initially obtaining proper hole size. The diamond is mounted in a graduated micrometer type barrel which facilitates compensation for diamond wear during a production run.

Many variables affect the rate of production and the tolerances that can be maintained. The type and hardness of the material, grinding wheel used, rate of stock removal and finish required are only a few of the factors that influence production rate. For example, at the Parker-Majestic plant, a 1¼" hole, 1¼" long in 52100 steel, Rockwell hardness of 62C, is ground in two minutes on this machine. The micro finish is approximately 12.

Use HANDY Card, opposite page 68. Encircle No. 101

New Cincinnati No. 1 Cutter and Tool Grinder

The Cincinnati Milling Machine Co., Cincinnati 9, Ohio, has added the fifth member to its line of cutter and tool grinding machines. The latest addition, the No. 1 Cutter and Tool Grinder, is designed primarily for grinding and reconditioning miscellaneous small tools and cutters. It has a capacity of 8" swing and 15" between centers.

Like its companion machine, the larger No. 2, the new model has the cartridge type grinding wheel spindle mounting with a double row of special preloaded anti-friction bearings, packed in grease for life-time lubrication. The cartridge type unit may be readily replaced after years of service, thus restoring new spindle performance into the machine in an interval of minutes.

A reversible ½ h.p. motor drive, built-in to the wheelhead, provides the desired direction of grinding wheel rotation; spindle speeds (6260 or 3730 rpm) are obtainable from a tooth grip drive belt and sheave arrangement.

Grinding wheel collets are quickly interchanged by removing a socket head screw, a feature that saves wear and tear on the spindle and operators knuckles.

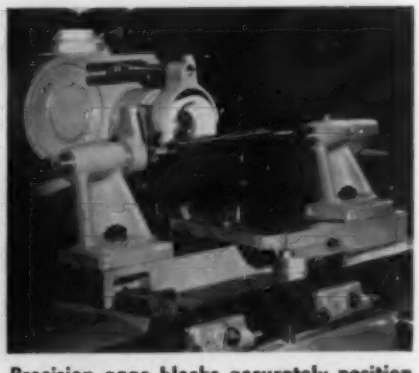
Anti-friction table slide provides ease of table movement. Duplicate controls give the operator a choice of operating the machine at the front, right-hand end of the table; or at the rear, right or left-hand side of the wheelhead.

An innovation is the 360° eccentric wheelhead swivel, adding 3 in. to the conventional cross range of 4½ in.

Another design innovation is the swivel table "Tange Bar" taper setting device. Utilizing precision gage blocks, the taper setting device enables the operator to quickly position the swivel table, thus eliminating most of the "cut" and "try" when grinding angular cutters and tapered reamers. Based upon the trigometric function of the tangent of the angle, the operator either multiplies the tangent of one-half the known value of the included angle by 12, or utilizes the given value of the taper per foot from the centerline, as the case may be, to obtain the correct gage block setting. Replacing either of these values with corresponding precision gage blocks, the swivel table is then accurately positioned for grinding the taper.

The double-end anti-friction spindle of the universal workhead (standard equipment), accommodates No. 12 B. & S. (No. 5 Morse optional) taper shanks on one end and No. 50 Series National Standard on the other end.

Double end spindle takes either No. 12 B. & S. or No. 50 Series National Standard taper shank cutters.



Precision gage blocks accurately position swivel table when grinding tapers.

Electrical controls are built-in, neatly recessed in a compartment at the front of the machine. A disconnect switch, operated by the latch handle on the electrical compartment door, shuts off the current when the door is opened. Additional safety will be found in the transformer unit included with the controls for shops operating on high voltages. It reduces the voltage to 110 at the push-button station. Push buttons are also built-in. They consist of start and stop button, and, for machines utilizing the cylindrical grinding attachment, an additional two-way switch for the attachment motor.

A wide variety of attachments extend the range of the machine for sharpening miscellaneous small cutters including those of sintered carbide.

Complete specifications and engineering data may be obtained by writing to The Cincinnati Milling Machine Co., Cincinnati 9, Ohio, publication M-1852.

Use HANDY Card, opposite page 68. Encircle No. 102

New Aro Heavy Duty 3" Grinder

A new Heavy Duty 3" Grinder is announced by The Aro Equipment Corporation, Dept GF, Bryan, Ohio.

Weight of this new Aro Model 7600 air powered Grinder is 5½ pounds; length 16¾ inches; diameter 2-1/32 inches; speed 17000, 14000, 12000, 9000 RPM (governed); spindle ⅛" x 11", ½" x 20", ⅜" x 24".

Features include multiple ball bearing spindle; directional exhaust deflector; all steel housing; new internal ball bearing governor; built-in-automatic oiler; tamper proof external governor adjustment; "quick as wink" throttle.

Applications range from cleaning scale to removal of large quantities of metal from castings, billets and forgings.

Use HANDY Card, opposite page 68. Encircle No. 135

Large Thread Grinder Grinds 10 Feet of Thread In One Setting

In response to a demand for a machine to grind long threads on such parts as aircraft actuator screws and machine tool lead screws Ex-Cell-O Corp., of Detroit, Mich., has developed a larger thread grinder. Several of these machines are now being used to grind ball race screws wherein anti-friction balls circulate between the nut and the screw. This type of screw is finding wide use in moving heavy loads under accurate control and with a minimum of power.

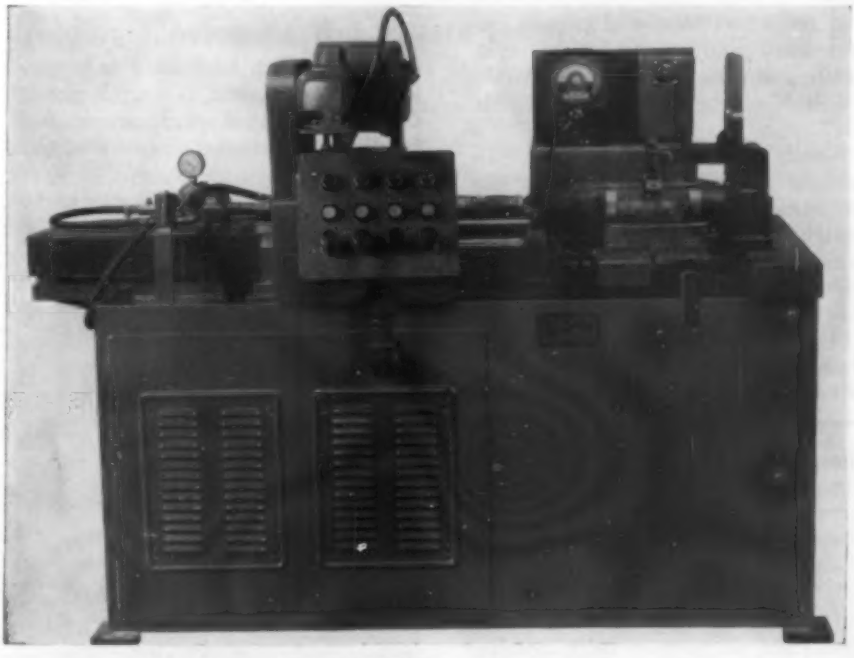
The new machine, Style 120 Ex-Cell-O Precision Thread Grinder, will grind 10 feet of thread length in one setting, will accommodate work up to 12 feet long between centers, and will hold close tolerances on form, pitch diameter and lead. Workpieces longer than 12 feet can be inserted through the work spindle, and threads longer than 10 feet can be ground a section at a time, or by turning the work end for end. The lead at adjacent sections can be picked up and continued accurately.

Automatic features of the Style 120 Thread Grinder include feed to finish size, grinding wheel dressing, resumption of the grinding cycle after dressing, backlash compensation, control of coolant flow, lubrication, and retracting the grinding wheel at the end of the grinding cycle.

One of the features that insures precision in this long grinder is that the work table is fully supported the full distance of its travel. Anti-friction rollers under the table provide ease of movement, which also contributes to accuracy. The base ways are completely covered and protected at all times by a wide belt that is attached at both ends of the table and travels on rollers around the ends of the machine and under the base as the table moves.

Complete information and specifications on the Style 120 Precision Thread Grinder are available from Ex-Cell-O Corp., Detroit 32, Mich.

Use HANDY Card, opposite page 68. Encircle No. 103



Large Automatic Honing Machine

A large new automatic honing machine of single spindle construction with a two-position fixture which can be loaded or unloaded while one piece is being honed is announced.

Designated as the Superior Model "SA", the machine requires but one operator. Automatic air gaging has been built into the honing mandrel which, after each honing cycle, moves into the bore and gages the part just honed.

Movement of the honing head, fixture and air gages is hydraulically controlled and actuated by solenoids.

Constant pressure on the stone expansion is maintained by air which also controls rapid expansion and release of the honing stones at the beginning and end of each cycle.

A push button type central control panel with signal lights, located on the front of the machine, governs the entire operation other than loading and unloading.

A built-in electric timer allows variable cycling for the most efficient operation.

The machine has a fabricated steel base containing the hydraulic system and coolant unit, with the electrical control panel mounted on the back.

The spindle is driven by a ½ hp, T.E., F.C. 220/440 volt, 60 cycle, 3 phase motor; the hydraulic system by a 1 hp, T.E. 220/440 volt, 60 cycle, 3 phase motor and the coolant system by a 1/10 hp, 220/440 volt, 60 cycle, 3 phase Ruthman centrifugal type pump.

Each machine is built to customer's specifications. Superior Hone Corp., 1637 Elreno St., Elkhart, Ind.

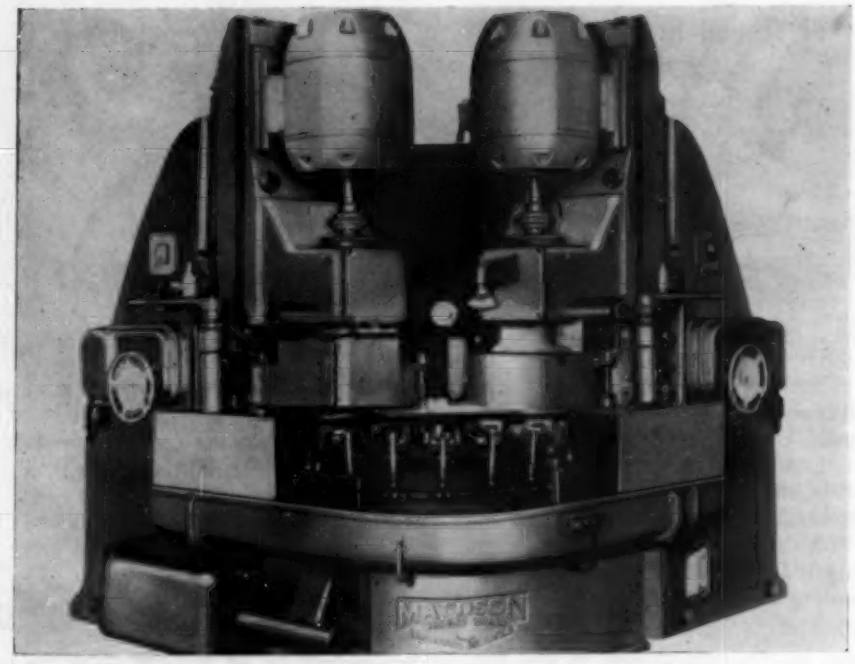
Use HANDY Card, opposite page 68. Encircle No. 104

Angle Heads for Shaft Grinders

Wyzenbeek & Staff, Inc., 223 N. California, Chicago, Ill., announce that they now are in production on a new Quick-Change Angle Head which features thumb controlled water feed, fully protected copper feed line, adjustable wheel guard, and precision ball bearings. The quick-change feature permits the user to rapidly and easily change from coarse to fine grinding wheels or to a straight handpiece as required.

These angle heads are designed for use with WYCO flexible shaft grinders.

Use HANDY Card, opposite page 68. Encircle No. 105



Single-Pass Grinder For Processing Connecting Rods

Mattison Machine Works, Rockford, Illinois, has brought out an automatic double-spindle, single-pass, rotary table grinding machine for processing large truck engine connecting rods.

Mechanical clamping and unclamping devices operate automatically as each work holding fixture rotates past actuating cams bracketing the loading station. Rough forgings are finished in one pass under the wheels. One wheel grinds the crank ends, the other the pin ends. Stock removal is .008" on each side.

Automatic down feed—actuated by sizer-gauges which constantly and accurately check dimension being machined at each wheel head—compensates for wheel wear and permits uninterrupted production with only spot-checking of parts for size. Step between two ends of the rods is held within .001".

Wheels are self-dressing. Once the machine is set into motion, the only downtime normally required is for replacing a wheel that has been worn beyond its useful limit. Production rate for two operations on two sides is 400 rods per hour.

For further information: Mattison Machine Works, Rockford, Ill.

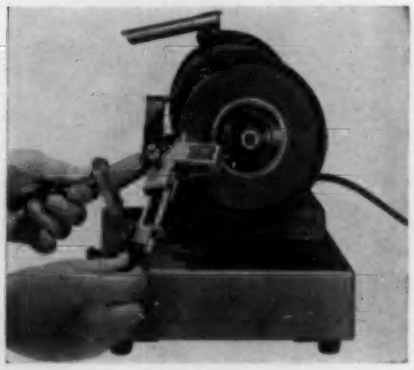
Use HANDY Card, opposite page 68. Encircle No. 106

Drill Sharpening Kit

A scientifically designed drill sharpening kit, is announced by Swanson Mfg. Co., 1236 Sherman Ave., Evanston, Ill., which takes guesswork out of drill sharpening.

The kit consists of:

(A) Drill Grinding Attachment which holds the drill to be sharpened in a sliding "V" Block (for twist drills from ⅛" to ¾"). Operating parts and adjustments such as micro-adjusting Nut, Follow-up block, "V" block set Screw, Drill Clamping Screw, Hold-Down Block, Lip Positioner adjusting Screw, Lip Positioner Tension Screw and Spring, adjustable Lip Positioner, and Clearance Angle Screw with Indicator Plate, all serve to assure absolute precision drilling.



(B) The Rocker Plate, which includes a Drill Size Gauge Plate, Gauge Plate Set Screw, and the Rocker Plate Handle which is used for operating the Rocker Plate.

(C) A heavy Metal Base, 12" x 10¾" x 3".

(D) 3-Way Drill Point Gauge checks the angles ground and serves in selecting the right drill.

The kit has been designed especially for 6" bench grinders with wheel spread up to 15", and 5" to 5⅛" from base to center of spindle. However, other sizes can be adopted by blocking up grinder or Rocker Plate.

Use HANDY Card, opposite page 68. Encircle No. 107

New Wheel for Foundries

A longer-lasting grinding wheel for gray iron foundries has been developed by Electro Refractories Corp.

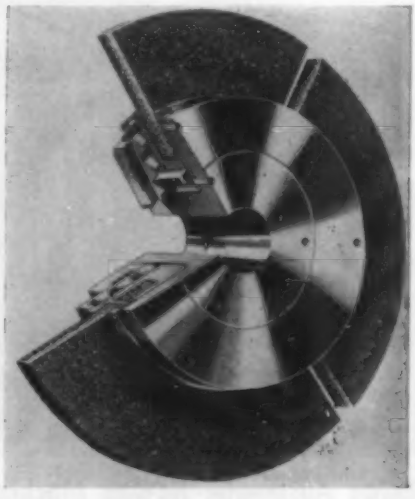
Secret of the wheel's increased life span is a new vitrified bond which holds the abrasives material together. Field tests show the new wheel lasts up to 35 per cent longer than previous models without loss in cutting rate.

The new bond gives the wheel an unusual ability to hold a sharp corner on its grinding face. This is important in "snagging," or grinding excess metal from gray iron castings.

Use HANDY Card, opposite page 68. Encircle No. 108

Constant Diameter Grinding Tool

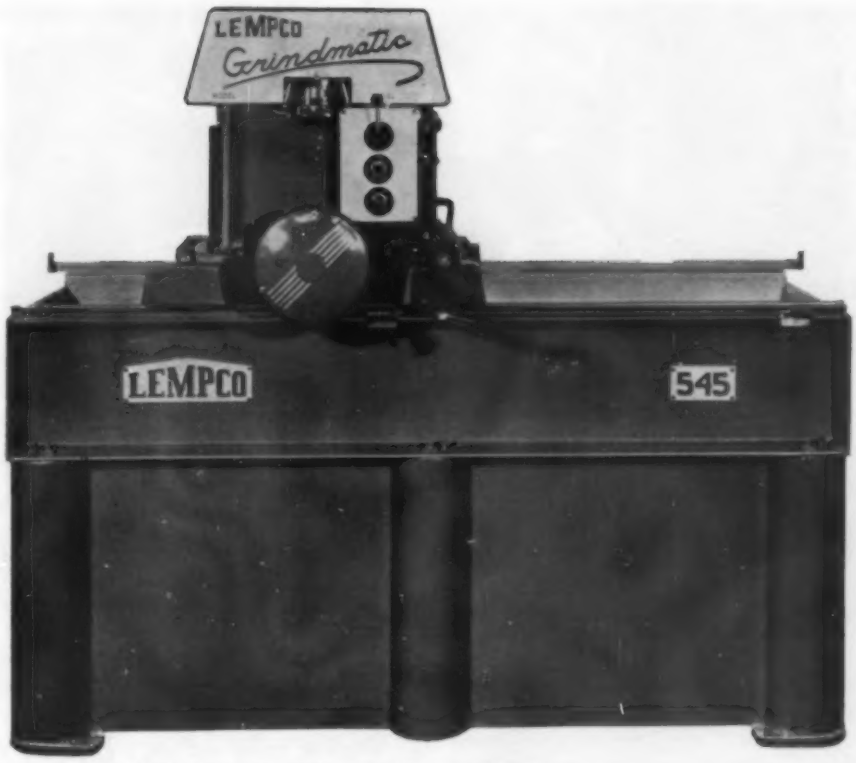
New "constant diameter" Kodiak Grinding Tool for all types of grinding operations distributed by Continental Products, Inc., Dept. 4G, 872 E. 140th St., Cleveland 10, O., is said to provide substantially increased grinding efficiency and greatly decreases grinding costs. Adjustable hub of Kodiak Grinding Tool holds abrasive segments. Scroll plate built into hub makes it possible to adjust abrasive segments, which are locked into place by the same method as a scroll chuck. Constant peripheral speed is maintained by slightly increasing diameter of tool

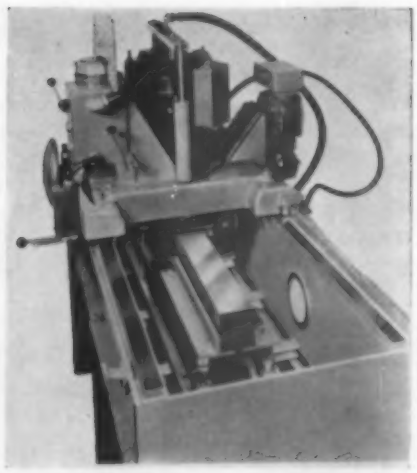


before each wheel dressing. Wide range of adjustment assures maximum usefulness of abrasive segments. Equivalent of an "extra" 1½ in. diameter on a standard 7 in. grinding wheel can be used without altering peripheral speed or diameter of grinding tool. Open slot between abrasive segments acts as air or coolant pump and directs stream of air or coolant directly onto surface being cut.

"Constant diameter" grinding tools fit all standard grinding machines and can be used for all types of grinding operations.

Use HANDY Card, opposite page 68. Encircle No. 109





Low-Priced Automatic Wet Surface Grinder

A new, low-priced, wet automatic Surface Grinder, Model 545 Grindmatic, is compactly designed with conveniently grouped controls located at easily accessible sight and hand levels.

Work can be secured with the conventional industrial holding fixtures or with the use of a magnetic chuck offered by the manufacturer as optional equipment.

The design provides maximum work visibility at all times allowing inspection for finish and accuracy without the necessity of removing the work piece from the machine or disturbing the grinding cycle.

All backlash is eliminated in the feed mechanism of the grinding wheel by a pneumatic counterbalance. This device also makes operation practically effortless.

On the standard model, a 3 hp motor drives the wheel spindle and 12″ grinding wheel at a speed of 1140 rpm. The traverse speed rate is fixed at a constant 45″ per minute. Length of the traverse is controlled by adjustable reversing stops which can be easily and quickly changed. Once the stops are set, the travel over the work is automatic. Flame-hardened and ground ways insure lasting precision.

Ample coolant flow is provided by a large capacity pump and a 50 gallon reservoir with a sloping and easily drained sump.

Specifications are: Work capacity 38″ long, 11½″ wide with a maximum height of 11″. Bed dimensions - 71″ long x 20″ wide. Overall height 65″, depth 39″, length 74″, wheel motor 3 hp, feed motor ½ hp, wheel diameter 12″.

Machine can be furnished with various hp motors, wheel sizes, traverse speeds and bed lengths. Length is unlimited since all way loads are transmitted directly to the floor through the heavy fabricated bases. Write: Lempco Industrial, Inc., Bedford, Ohio.

Use HANDY Card, opposite page 68. Encircle No. 110

Popular-Priced Bench Grinder

The grinder is ruggedly made for tool room and production work suited to this type of machine. The 1/3 hp capacitator-type motor is fully enclosed, with sealed-in ball bearings, and is rated at 3450 rpm.

The grinder, "Type R", comes equipped with one fine and one coarse grinding wheel. Tool rests are fully adjustable to compensate for wheel wear. Wheel guards may be removed to attach buffing, polishing wheels, etc. A chuck is easily attached to the 15/16″ motor shaft. Drill grinding attachments and other accessories are available.

The base is mounted on heavy rubber feet and the on-off toggle switch is conveniently located in the front. A relay is mounted in the base. The grinder is available in 110 volt single phase, 60 cycle, or in 220 volt 3 phase, 60 cycle; also 440-volt, 3 phase, 60 cycle. Shatter proof eye shields and cast iron pedestal with tool tray and water cup are also available. Roberts Motor Co., Bronson, Mich.

Use HANDY Card, opposite page 68. Encircle No. 111

Tumbling Machine Provides Larger Finishing Output

The new machine, known as the V-8 Model, features truly versatile 8 cu. ft. capacity. A much improved direct drive does not require chains or sprockets. The standard equipment includes a magnetic brake motor with jogging and reverse switch, a water-proof start-stop switch mounted on the front panel for easy access, and a large cover completely housing the variable speed drive.

Shipments of the V-8 Model now are available from stock in 1 to 4 barrel compartments, either unlined or lined with vinyl plastic lining. Further information may be obtained from the Rampe Mfg. Co., 14915 Woodworth Ave., Cleveland 10, Ohio.

Use HANDY Card, opposite page 68. Encircle No. 112

New Carbide Lapping Machine

Wickman Manufacturing Co., Dept. FG, Oak Park, Mich. announces the availability of a new type super finishing machine for carbide tools. According to the manufacturer this new machine enables users of carbide tools to obtain 50% longer cutting life over conventional diamond wheel finished tools.

A highly finished lapped cutting edge can be obtained in a few seconds with negligible diamond cost. An inexpensive diamond hone is used instead of the normal 6" diamond wheel.

The machine operates on a new principle. A small diamond impregnated finishing hone laps the cutting edge of the carbide tool with a recipro-

cating movement in 4 directions in a vertical plane until the required finish is obtained in a matter of seconds. Adequate lubrication is provided to the finishing stone by means of a built-in self-priming pump.

Carbide tools are ground in the usual way and in most cases one grinding operation is sufficient before super finishing on the new machine.

The carbide tools are super finished without generating heat.

The super finishing machine was developed in Europe and has been used for some time by a large automotive manufacturer's German plant. Exclusive manufacturing and distribution rights for the United States are owned by Wickman Manufacturing Co.

Use HANDY Card, opposite page 68. Encircle No. 113

Stone's M75 Cuts Any Metal

The Model M75 Cut-Off machine by Stone Machinery Co., Inc., Manlius, N.Y., is specially designed for continuous heavy-duty production at top speed and minimum cost. The M75 cuts even the hardest metals with speed and accuracy.

With either abrasive cutting wheel or circular steel saw blade, the M75 cuts to a tolerance of ±.005", leaving a milled-like finish which often eliminates subsequent operations. The cut produces no change in characteristics or hardening of the metal.

A 7½ hp geared-in-head motor assures positive drive (there are no belts

Shatterproof Qualities of New Material for Safety Glasses

Authentic, unretouched photographs showing results of impact and pierce tests in Optilite, the new lightweight safety lens material of compounded resins—as compared to safety glass lens of equal thickness.

In this test, developed by the United States Safety Service Company, makers of the new Optilite lens, a pencil-shaped bar weighing 44 grams is used, with a sharp steel Singer sewing machine needle inserted in the end. In the test, the weighted needle-pointed bar is dropped a distance of 87" in a tube, by trigger control, onto the apex of the lens at the rate of 6.5 mil. sec. In a series of tests, with the full force of the needle-pointed-weight dropped 87" onto the very center of the Optilite lens, no specimens were fractured. Every specimen of safety glass, tested under identical conditions, shattered and broke.

Optilite lenses are not a glass, not a thermoplastic, but an entirely new-type lens material of compounded resins. It weighs half as much as safety glass and has approximately twice the strength. Available through the United States Safety Service Co., Kansas City 6, Mo.

Use HANDY Card, opposite page 68. Encircle No. 116

or pulleys) with undiminished power to the cutting edge. Also included as an exclusive feature is the fast-action self-centering vise which mounts on adjustable swivel plate calibrated in degrees. This provides instant change-over from straight to angular cutting up to 46°.

The M75, shown here with size 2 magnetic starter and pushbutton station, requires only a 2½' x 4' floor space. Work support is 31½" from floor.

Use HANDY Card, opposite page 68. Encircle No. 114

Drill Grinder for Small Drills

Alina Corp. introduces a new drill grinder which is designed to sharpen small drills in as little as 30 seconds. With only 2 chucks, it will sharpen drills from .012" to .240". Guaranteed concentric accuracy of sharpened drills is .0004" or less. Unit requires no special skill to operate. No resetting is

needed for grinding different diameters or types of drills. One quick adjustment adapts it for right or left hand drills. Write Alina Corp., 401 Broadway, New York 13, N.Y.

Use HANDY Card, opposite page 68. Encircle No. 115

Mechanical Finishing Machine for Small Lots

Called the "Roto-Mite", the new machine is designed primarily for small lot production or experimental work. It is designed with a removable tub in which finishing mass is contained and rotated. This feature allows use of several tubs with different type masses. Each tub is a complete unit with built-in sludge removal system.

Removal of the tub does not require any modification or adjustment of the driving mechanism as the drive is a separate unit on which the tub is mounted.

Features of tub: locating and locking devices; an arrangement for continuous sludge removal through the bottom; a collector ring which has pipe fittings to allow connection to a recirculating tank or drain. A special floor is not required.

Main drive is a 5 hp. U.S. Varidrive (variable speed) vertically mounted in rear of the machine. Power unit is belt-connected to tub drive assembly. A remote speed control allows selection of processing speeds from 100 to 500 fpm.

In operation, the parts are held in fixtures attached to lower ends of vertically mounted spindles, which are mounted above the mass. Spindles lower to submerge parts in the rotating processing mass. As the spindle submerges the part into the mass, it rotates, thus all sides of the part are exposed to the mass to insure uniform finishing.

The Roto-Mite has four spindles and is available with three different spindle arrangements. Spindles are complete with manual flushing, and manual controlled air-operated fixture locking and unlocking. Rotation of the spindles stops automatically when spindles are raised from the mass. Made by Roto-Finish Co., Kalamazoo, Mich.

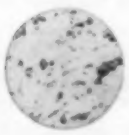
Use HANDY Card, opposite page 68. Encircle No. 117

give you 2 Stage* COOLANT CLEANING

for selective degree of coolant clarity

Barnesdril Engineers provide two distinct stages in coolant cleaning in the new Kleenall Unit by combining *practical magnetic separation for removal of ferrous particles, with *positive cleaning by filtration to elliminate non-ferrous or other objectionable foreign matter. With the control inherent in this method it is possible to give you the exact degree of coolant cleanliness that is practicable for your production operations. Results up to 99% removal of all coolant wastes are readily accomplished.

Complete Lab Facilities for Your Convenience



Typical microphoto of composite swarf from a high production cutting operation.

In their modern coolant laboratory, these engineers can precisely measure waste particles and classify them by physical types. Percentage of contamination is thus determined, and they are then able to select a filter media and size of unit to give you the degree of coolant clarity you desire.

Why not ask them to analyze your coolant cleaning problems and make recommendations for obtaining the most practical results. Any Barnesdril representative will gladly supply you with complete details.

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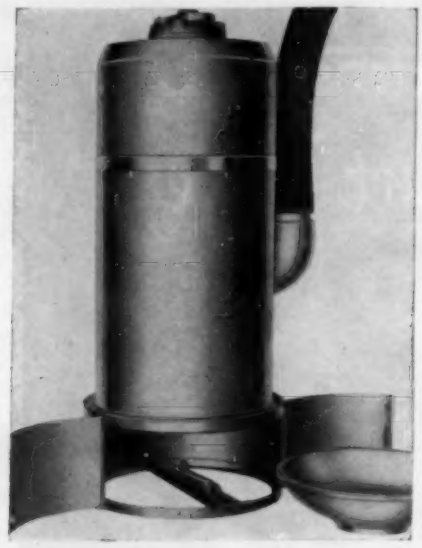
Encircle No. 226 on card opposite Page 68



Dust Exhauster for Grinding

Manufactured and sold by Abrasive Machine Tool Co., Dept. GF, East Providence, R.I., this compact, self-contained dust exhauster was developed by Professor Feifel of Vienna from calculations based on advanced aerodynamic design principles.

The Dustsnaire is guaranteed to remove all particles above 5 micron grain size of a specific gravity of 1.5 or higher.

The Dustsnaire suffers no efficiency drop in operation. Furthermore, there are no filter bags to inspect, repair, or replace.

It occupies less than 4 sq. ft. of floor area, and it is approximately 4′ high. Its rated capacity is 309 cu. ft. of air per min.

Use HANDY Card, opposite page 68. Encircle No. 118

Many Improvements in Drill Grinder

Dumore Precision Tools announces the redesign of the Dumore Drill Grinder, incorporating more than 20 changes and improvements.

The Series 21 Drill Grinder sharpens 2-lip, right-hand drills easily and accurately; its use requires no basic machine shop training or special skills. Drills may be ground in a matter of a few seconds.

The Drill Grinder stands on any small bench or table and is easily portable from one location to another, weighing but 40 lbs. Drill sizes from No. 70 up to ¼″ in diameter can be ground to point angles from 90° through 150°. Clearance angles can be selected and quickly changed from 5° to 15°. Incorporating a 1/5 hp., ac-dc universal motor, the grinder swings a 2″ diameter dual-grit grinding wheel. The medium and fine-grit halves of

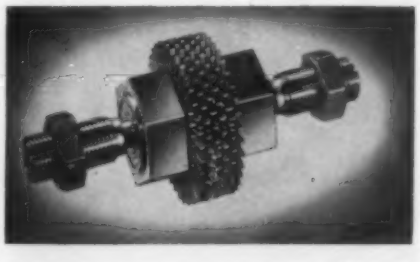
the wheel permit the sharpening of large and small diameter drills with minimum wheel breakdown and elimination of drill burning. Write Dumore Precision Tools, Racine, Wis.

Use HANDY Card, opposite page 68. Encircle No. 119

Dresser Cutter "Picks" Abrasive Grain From Discs

A new low cost Dresser Cutter for sharpening abrasive discs, and called the Besly "Wise Type" Dresser Cutter, it has slim "fingers" which pick abrasive grain from the surface of grinding discs instead of crushing the grain and rolling it off, as do conventional broad tooth cutters. This cutting action sharpens the disc without changing its grinding characteristics. The "pick-out" teeth require less pressure on the disc for efficient sharpening and last longer because friction is reduced.

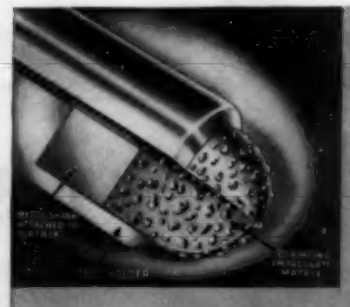
A square arbor for the cutter assembly also contributes to longer cutter life. It holds the cutters firmly in place with the teeth in staggered position and prevents chewing the arbor spindle.



Almost frictionless rotation of the cutter assembly is assured by sealed ball bearings holding the square arbor. Buttons pressed into the side of each individual cutter eliminate the need for spacing washers and speed assembly and replacement. Only six cutters are needed to make up a complete dresser cutter assembly.

The "Wise Type" Dresser Cutter is interchangeable with previous cutters used on Besly Grinders and can be adapted to competitive dresser holders. Besly-Welles Corp., Beloit, Wis.

Use HANDY Card, opposite page 68. Encircle No. 120



ECONOMICAL WHEEL DRESSING...

... with Diamond Impregnated Dressers

80% COST SAVINGS ... the cost difference between Diamond Impregnated and single point Diamonds is passed on to you.

INCREASES CUTTING EFFICIENCY ... many small Diamonds reduce the area of diamond contact on the wheel.

EASIER TO USE ... no special adaptors ... no moving parts ... by slightly turning the tool, new cutting surfaces are available.

NO REMOUNTING COSTS ... the entire Diamond Impregnated matrix can be used up.

LOSS AND BREAKAGE MINIMIZED ... single Diamonds are expensive ... many small Diamonds reduce the risk from loss and breakage.

Send for Catalog

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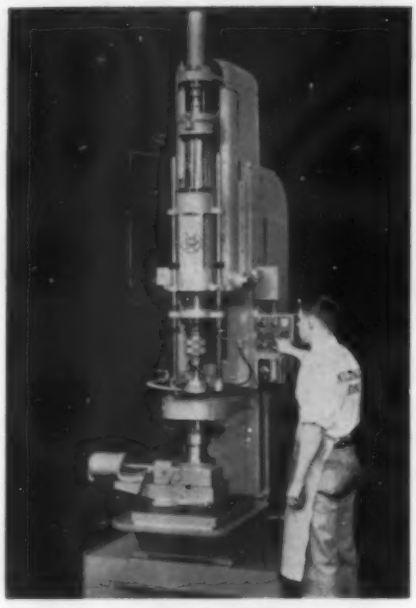
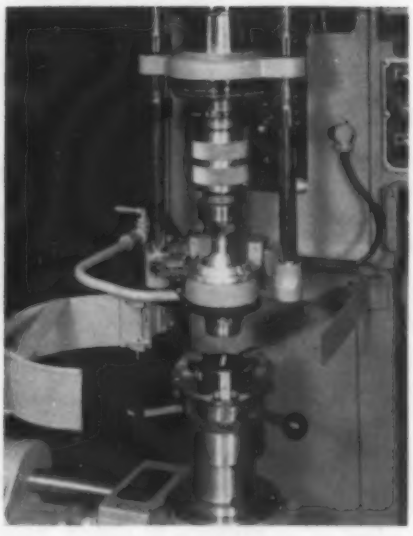
Pioneering in Diamond Impregnated Products since 1932.

Encircle No. 227 on card opposite Page 68





Spline Honing Machine

Model 728 Hydrohoner, designed for a broad range of honing operations, is built by Micromatic Hone Corp., 8100 Schoolcraft Ave., Detroit. One adaptation of this model is used for spline honing . . . in which hardened gears are processed so the bearing surfaces of the splines are generated concentric with the pitch of the teeth, straight and round, and have a finish that will not pick-up and gall the shaft.

Previous to the adoption of honing it had been necessary to anneal these surfaces before the final machining operation. Result was soft bearing surfaces; character of the finish made it difficult to fit the shafts to the gears in 0.0002-inch increments because the soft surface tended to pick and gall the shaft.

Microhoning solved this problem because surface hardness does not affect spline honing. Instead, the problem was to obtain proper tool actuation in the confined area. This is particularly significant because, unless heat-treatment is controlled very carefully, the hole may be out-of-round and tapered as much as 0.006-inch when it reaches the honing operation. To remove this amount of stock and correct inaccuracies, the cutting path of the abrasive grit must be varied and all stones dressed an equal amount.

In conventional honing jobs, this is accomplished by rotating the tool as it is reciprocated through the bore. To hone splines, tools are designed with a stone for each spline—the stone about half as wide as the spline. Rotation is replaced by an oscillating motion. The stone is swept across the spline as the tool is reciprocated. To get full surface coverage by all the stones, the part is indexed periodically during the honing cycle.

In this operation, Model 728 processes forged steel, 58 to 60 Rockwell C hardness. It removes 0.002 to 0.006-inch stock on diameter, holding out-of-roundness and taper to less than 0.0003-inch. Finish is 15 to 20 micro-inches r.m.s. Size is held so shafts can be fitted easily with 0.0002-inch minimum clearance. The model has cycle time of 35 to 40 seconds per gear, turns out 350 to 450 gears in an 8-hour shift.

Use HANDY Card, opposite page 68. Encircle No. 121

Abrasive for Barrel Finishing

A new abrasive product for barrel finishing is announced by The Exolon Co., 992 East Niagara St., Tonawanda, N.Y. The material is made from selected grades of aluminum oxide and processed to remove all sharp edges which might scratch the work. Sizes range from two inches down.

The Exolon Barrel Finishing Abrasive is made in an electric arc furnace from bauxite which is melted and forms hard aluminum oxide crystals with facets in every conceivable direction.

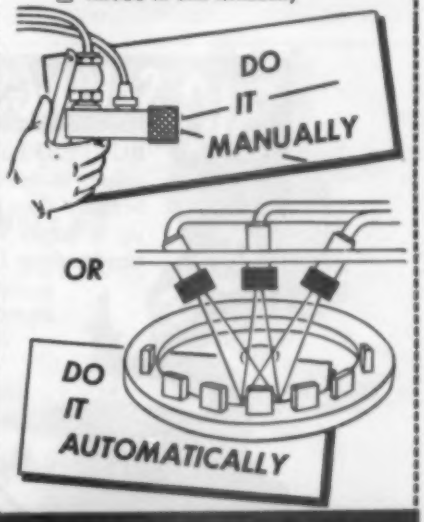
Constant use of the material does not impair the abrasive quality, but does somewhat reduce the size.

Use HANDY Card, opposite page 68. Encircle No. 122

which of these POLISHING PROBLEMS are yours?

CHECK*

- ☐ Reduction of belt sanding stages
- ☐ Cutting down buffing time
- ☐ Reduction of hand polishing
- ☐ Blending directional grind lines
- ☐ Lowering micro-inch finishes
- ☐ Exposing cracks and fractures
- ☐ Smoothing belt marks
- ☐ Imparting non-directional finishes
- ☐ Semi-reflective surfacing
- ☐ Blending brush marks
- ☐ Surface uniformity
- ☐ Removal of stress marks
- ☐ Obliterating
  - ☐ Scores ☐ Tool marks
  - ☐ Reliefs ☐ Chatter
  - ☐ Pits ☐ Scratches
- ☐ Matte finishing
- ☐ Thread fit and tumability



WITH PRESSURE BLAST WET BLASTING

TWO SPEED

* This ad is your coupon. Check off your problem(s) and mail today for free illustrated literature . . . application data . . . case history information!

THE CRO-PLATE COMPANY INC.

747-D WINDSOR STREET
HARTFORD 5, CONNECTICUT

Encircle No. 228 on card opposite Page 68

Improved Sterling "RK-2" Tool & Cutter Grinder

Increased capacity, up to 22" diameter cutters, is one of the improvements in the Sterling RK-2 Tool & Cutter Grinder, announced by McDonough Mfg. Co., Eau Claire, Wis.

The RK-2 is designed specifically for grinding tools and cutters. The heavy anti-friction tables required on universal grinders, such as the Sterling G-2, have been eliminated. Instead of moving the work past the grinding wheel the spindle is mounted on linear ball bushings and moves past the work on a hardened and ground steel bar. The usual workholding fixtures, mount on a column that moves vertically and in-and-out.

The result is said to be a much more compact machine that is easier to set up because all controls are grouped in easy reach from the front of the machine and easier to operate because relatively little weight is moved.

The radically different design of the Sterling RK-2 makes it possible to provide a machine with complete versatility and greater capacity than a Universal Grinder at about ½ the cost, according to the manufacturer.

Use HANDY Card, opposite page 68. Encircle No. 124

Staple Hand Honing Machine For I.D. and O.D. Parts

A completely new hand honing machine, Model No. 5 for O.D. and I.D. parts ranging from ⅛ to 1" diameter has been added to the line of machines manufactured by Staple Engineering Co., Birmingham, Mich.

Feature is in the spindle drive, the speed of which may be varied from 160 rpm to 1600 rpm by simply turning a small lever mounted in front of and in easy reach of the operator.

The spindle speed may be changed while the spindle is rotating and is infinitely variable through the speed range which is controlled electrically. A ½ hp motor and eddy current clutch drives the spindle.

A light pressure on the foot pedal which is assembled in the center of the machine, will release the brake, start the spindle to rotate and feed the honing stones out to an adjustable preset stop. When foot pedal is released the honing stones retract, current to clutch is cut off and the brake stops the spindle rotation.

Honing tools and abrasives are supplied by the Staple Engineering Co. These are assembled into the machine spindle ready for use without the need of wrenches or other tools.

Use HANDY Card, opposite page 68. Encircle No. 125

Coolant for Cutting and Grinding Aluminum

A stain-free coolant provides characteristics which eliminate problems commonly associated with cutting and grinding aluminum.

This product, which has a high degree of lubricity and detergency, has anti-weld properties that prevent welding of chips and dust to tools and wheels. It mixes easily with water to form a stable emulsion. Designated International Compound 131-A, it will not discolor aluminum alloys, and produces a superior finish, both in appearance and profilometer readings. It does not react with aluminum dust, and therefore does not create unsanitary coolant conditions.

This compound has been successfully used in large installations involving the use of central cooling systems.

Made by International Chemical Co., Inc., Dept. A78, 2628 N. Mascher St., Philadelphia 33, Penn.

Use HANDY Card, opposite page 68. Encircle No. 126

BIG $ SAVINGS FROM SMALL INVESTMENT

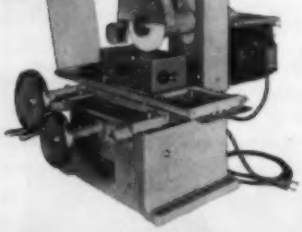
BUTTERFLY Bench-type precision machines increase tool-and-die shop efficiency, because they save hand labor, and avoid tie-up of larger floor-type machines. Many jobs can be done faster on these small machines.

BUTTERFLY PRECISION FILING AND SAWING MACHINE

Eliminates costly hand filing, sawing and lapping on dies, gauges, tools. So smooth-running that you can balance the flat end of a pencil on the table while machine is running.

BUTTERFLY PRECISION SURFACE GRINDER

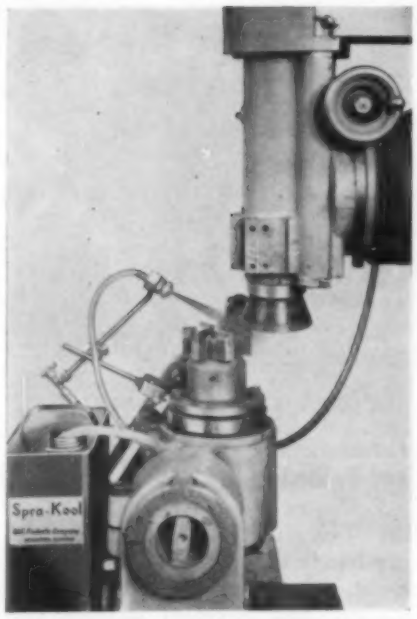
A dual-purpose machine. Rigid and powerful enough for deep roughing cuts, sensitive enough for fine grinding to highest accuracy. Dynamically-balanced spindle supported at both ends by duplex-mounted angular-contact ball bearings.



Write for description, specifications and prices

HARVEY MANUFACTURING CORP.
Subsidiary of GERMANOW-SIMON MACHINE CO., Inc.
413 St. Paul St., Rochester 3, N. Y.

Encircle No. 229 on card opposite Page 68



Simple Spray-Coolant System Eliminates Dry Grinding

A new "Spra-Kool" system for quickly and economically applying spray-coolant to any type of dry grinding or polishing operation as well as certain drilling, milling, chamfering, or boring operations that do not require flood coolant, is announced by Bar Products Company, 3703 Highcrest Road, Rockford, Illinois.

The new system is designed with a simple valve and spray nozzle which provide a steady, uniform jet spray of coolant to tools and work.

By eliminating dry grinding, the new system provides longer wheel life . . . reducing the tendency of soft wheels to break down and hard wheels to lead. In addition, "Spra-Kool" prevents damaging work from excessive heat and makes possible better finishes and increased output. A rust inhibitor mixed with the coolant also prevents tarnish and rust stains.

The simple mechanism is designed for quick setups and easy use. A length of hose is attached to any air line, the nozzle is then positioned to the work, and the spray control is adjusted to provide maximum cooling results.

The amount of coolant applied is easily varied either by adjusting the air pressure or raising or lowering the siphon level of the coolant. Operation is unaffected by sudden or varied drops in air pressure. One gallon of the spray-coolant is sufficient for 4 to 6 hours of continuous operation.

The System is adaptable to any make of machine without special equipment. The complete unit includes a 1⅞" capacity adjustable clamp, full universal knuckle, air control valve, spray nozzle, 4 feet of air hose, 3 feet of rubber tubing, and a gallon container.

Use HANDY Card, opposite page 68. Encircle No. 123

Super Speeds in Abrasive Belt Grinding

A new concept in high speed material removal and finishing is demonstrated by the new Superspeed Belt Grinder and Sander announced by the Anchor Machinery Co., 229 W. Orange Grove Ave., Burbank, Calif.

Belt speeds in excess of 10,000 sfm have resulted in 300% higher production with an amazing increase in belt life, up to 3000% with standard abrasive belts, over usual slower speed operation, it is claimed. Previously discarded belts have been reused with efficiency. At super speeds, belts resist loading, even with non-ferrous and non-metallic materials. Operators report smoother operation with less work pressure and an absence of any "bumping" tendency ordinarily due to loading. Work is easily guided, permitting close tolerance grinding and snagging. Super speeds are effective on a wide range of materials such as die castings, ferrous and non-ferrous castings, machined parts, corrosion resistant steel, titanium and non-metallics such as leather and plastics.

Model No. 150 uses a 1½"x60" belt. The machine utilizes less than 1¼ square feet of floor space. Removable, graphited platen and adjustable tool rest are standard equipment. One piece, double row, sealed New Departure bearings are used. Contact wheel is precision ground and balanced for super speed operation. Belt angle is adjustable over a full 90°. Belt changing requires no readjustment, with automatic take-up and positive tracking.

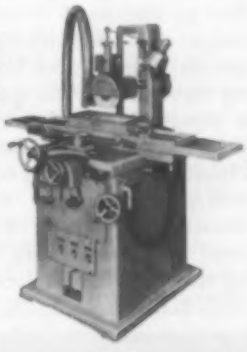
Superspeed No. 150 Belt Grinder is manufactured in bench and pedestal models, equipped with either ¾ or 1 HP, 115 V or 230 V, single phase or ¼, 1 or 2 HP, three phase.

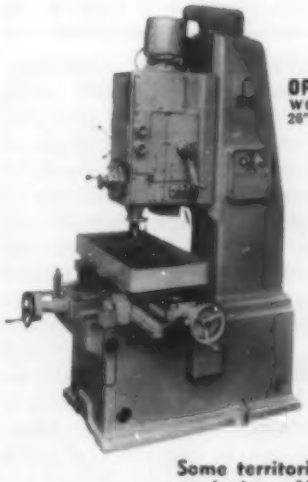
Use HANDY Card, opposite page 68. Encircle No. 136

aba

ULTIMATE IN PRECISION
REASONABLE IN PRICE

SURFACE GRINDERS
AND OPTICAL JIG BORER





OPTICAL JIG BORER
WORK CAPACITY:
20"x17"

SURFACE GRINDERS
WORK CAPACITIES:
13¾"x8", 24"x8", 49¼"x 16½"

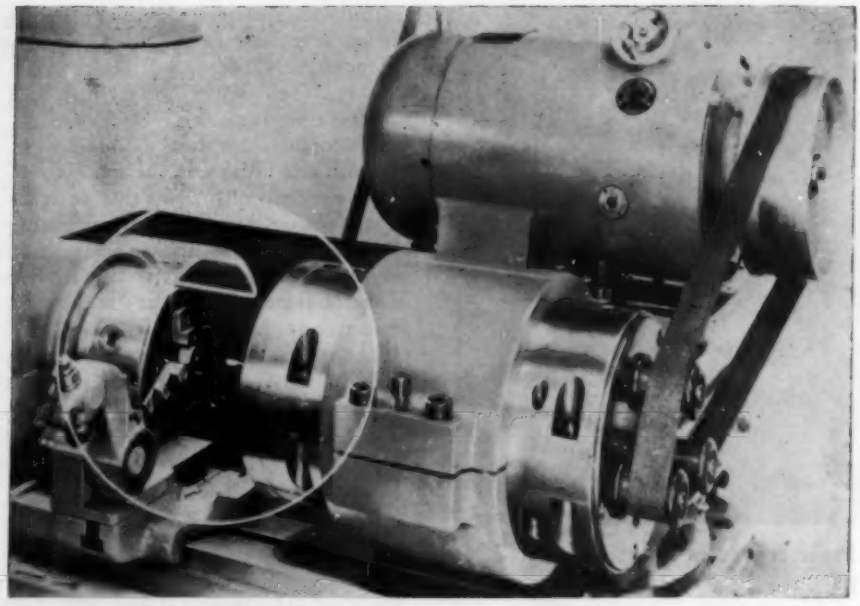
SPECIAL SURFACE GRINDER WITH VARIABLE SPINDLE SPEEDS
WORK CAPACITIES:
25¼"x15¾", 49¼"x 16½"

Some territories still available to reputable agents or dealers. Write for particulars.

THE CEE MACHINERY COMPANY

21-25 44th Ave., Dept. G-1 CEE Long Island City 1, New York

Encircle No. 230 on card opposite Page 68



200,000 RPM on Small Hole Grinder

There is an ever increasing demand for a tool that can grind small holes economically. The machines now in existence are using two different methods to attain spindle speeds in excess of 90,000 rpm. One uses high frequency, the other one employs a compressed air drive.

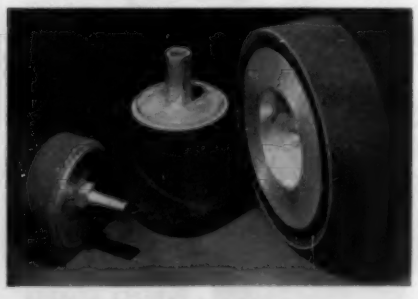
A new contact roller spindle has been developed in Germany which develops a maximum speed of 200,000 rpm. It distinguishes itself through its simple design and longevity. This spindle actually consists of a housing containing three belt-driven quills which run in super precision bearings at a speed of 50,000 rpm. These three quills drive a fourth working quill on the planetary principle by contact with the peripheries. The ratio of 4:1 results in a speed of 200,000 rpm in the working spindle. The spindle can be adapted

to any standard cylindrical grinder or lathe.

As a grinding medium one can use ceramic wheels which are available in a large assortment of sizes, or diamond wheels that permit precision grinding of holes of only 1/32" diameter.

This Contact Roller Spindle is distributed exclusively in the United States and Canada through Columbia International Corp., 10-35 44th Drive, Long Island City 1, N.Y.

Use HANDY Card, opposite page 68. Encircle No. 127



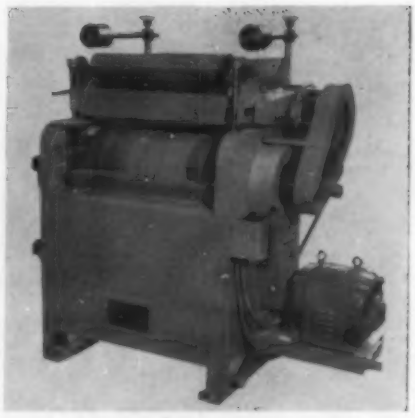
Abrasive "Band Wheels" in Sizes from ¼" to 6" Dia.

Even-Cut rubber-cushioned abrasive-band wheels are now furnished from stock in over 50 sizes from ¼" diameter x ½" width to 6" diameter x 2" width. Matching abrasive bands are available in open, closed and spaced grain coatings in aluminum oxide, silicon carbide and garnet in grits from 24 to 400.

With only one wheel, almost any kind of cutting, polishing or finishing can be accomplished by merely using the suitable type band and grit. The "Band Wheel" will not change diameter and consequently it maintains a constant peripheral speed resulting in uniform operating characteristics. Even-Cut "Band Wheels" are suitable for use with all types of metals, hard and soft woods, leather, rubber, glass, plastics, tile, etc.

These wheels consist of a plated alloy steel shaft with flanges holding a specially fabricated rubber wheel. Abrasive bands can be quickly and easily slipped over a wheel. As flanges are tightened, the resulting squeezing action against the rubber wheel positively holds the band in position without any tendency to slip or move. Even-Cut Abrasive Band Company, 8212 Carnegie Ave., Cleveland 3, Ohio.

Use HANDY Card, opposite page 68. Encircle No. 128



Automatic Feed Polishing and Deburring Machine

Equipped with an automatic feed, the Timesaver SMOOTH-O-MATIC can handle all types of flat stock and metal sheets, single plane curved metal surfaces and modified shaped and tapered metal pieces.

The work is fed over the abrasive belt at a high rate of speed with even pressure producing a fine finish. The Timesaver SMOOTH-O-MATIC can be used wherever abrasive finishing and deburring is done on such metals as aluminum, stainless steel, copper and other ferrous and non-ferrous metals.

For further information write Timesavers, Inc., P.O. Box L, Minneapolis 22, Minnesota.

Use HANDY Card, opposite page 68. Encircle No. 129

Kit of Rubberized Abrasives

Cratex Mfg. Co., 81 Natoma St., San Francisco, Calif., has developed an inexpensive, comprehensive polishing kit to handle deburring, smoothing and polishing applications. The kit contains an assortment of 24 of the most popular Cratex polishing wheels, cones, blocks and mandrels for cleaning and polishing molds, dies and castings; removing film, coatings and enamel; blending in and polishing welded seams after rough grinding; polishing bearing surfaces and raceways; cleaning and polishing commutators and contact points; and removing rust, heat marks, tarnish, excess solder, scratches and corrosion.

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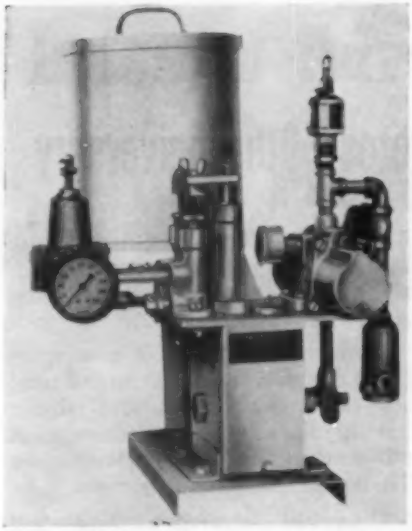


Lubricator for Abrasive Belts

The standard unit consists of an adjustable stroke pump driven by a reciprocating air motor and incorporating a spray control cylinder that triggers the air only when the fluid is being delivered to the spray nozzle.

Controls are provided to accurately regulate the frequency of application, the amount of lubricant pumped per stroke, and the air pressure at the nozzle. The unit has a 2 gallon lubricant storage tank piped to the liquid cylinder and comes complete with fittings, nozzle and air regulator equipped with gauge. The standard unit is recommended for belts up to 8" wide. Larger belts can be lubricated by adding additional pumping units. Write: Manzel, 315 Babcock St., Buffalo 10, N.Y.

Use HANDY Card, opposite page 68. Encircle No. 131

Abrasive Speed Tops 18,000 FPM

Through the development of a special method of processing abrasive coated cloth discs, New Era Engineering Co., 458 West 29th St., Chicago 16, Ill., has produced a grinder which operates at a perimeter speed of more than 18,000 feet per minute.

Known as the Neeco-2-Twenty Abrasive Coated Cloth Disc Grinder, the new unit is a twenty-inch diameter double disc machine. It is powered with a special 10 hp motor. It is direct driven, and supplied in 220 or 440 volts, 60 cycle.

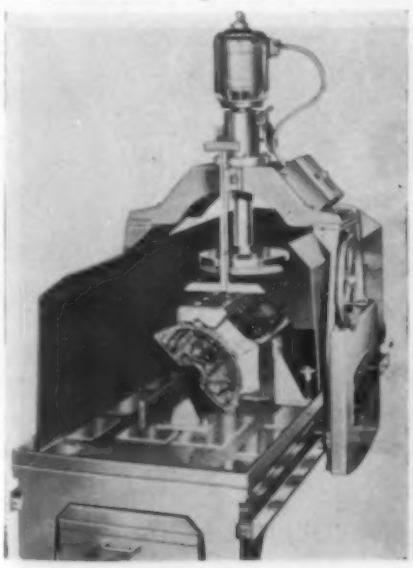
When both rapid material removal and fine finish are required, the use of coarse grit abrasive on one disc and fine grit abrasive on the other disc will accomplish this efficiently and economically.

The unit is designed to house its own high-efficiency dust collector within the machine itself (as optional equipment).

Use HANDY Card, opposite page 68. Encircle No. 132

New Automatic Wet Grinder

A new wet grinder designed for fast, efficient, accurate grinding and finishing of all types of metals and alloys, and accommodating from the smallest parts up to and including workpieces 64" long, 16" wide, and 24" high, is now available. Designed for easy loading, quick set-up and alignment, full vision grinding, and fully automatic operation—and featuring the use of a 5" faced, flat-dressed, 16" grinding wheel and radical new cooling-flushing system—the new wet grinder has proved as much as three times faster in handling cast iron stock. It is able to make a .010" cut in such material in a single pass, and yet leave a smooth surface finish of 30—80 R.M.S. while doing so. The machine is manufactured and marketed by the Peterson Welding Labs, Inc., of 1423 Virginia Avenue, Kansas City 6, Missouri.



The new wet grinder permits the largest workpiece to be loaded straight down from an overhead hoist or crane. Larger work is positioned by resting it directly on a horizontal locating rail, with smaller work positioned on a worktable pre-set on this same rail. The locating rail runs directly beneath and perfectly parallel to the path of the grinding wheel resulting in automatic longitudinal alignment of all work. Perfect lateral alignment is accomplished by hand-setting a single adjusting screw and checking with the built-in 24" protractor. Special fixtures for varying sizes and shapes of workpieces make set-up operation fast and simple. The construction of the ways on the machine assures extreme accuracy since they hook over *and* under the track and make it impossible for the carriage to lift in the grinding process.

Machine affords a full view of the work at all times and the operator can make a quick visual inspection at any point in the operation. With manual feed control, he can make a fast test cut at a low setting, back up and inspect the surface, then reset for .001 to .010 as needed, and complete the job with one pass. Of interest is the automatic feed available which permits the operator to make a test cut, set for the desired depth of cut, put the machine on automatic, then leave the work while the grinder automatically completes the job and stops operation.

The new Peterson Wet Grinder is ideally suited to all industrial assembly line operations. An extension of the horizontal guide bar permits workpieces to be set up on a full assembly-line basis, and two or more machines can be used in conjunction simply by connecting these guide rails. One surface of a workpiece could be finished on one grinder pre-set to finish that surface, the work moved on and rotated, and a second surface of the work finished on a second grinder pre-set to finish that surface. Another feature of the new grinder is its unique centrifugal-force-flush coolant system. With this system, coolant is forced, under pressure, down through the hollow shaft of the spindle motor and on down through a hollow spindle and over a baffle which distributes it out in all directions over the working surface. This "inside-out" action results in thorough flushing and super-cooling and permits the use of the unusually large 5" faced, flat-dressed, 16" grinding wheel.

Use HANDY Card, opposite page 68. Encircle No. 133

Precision-Ground Gear Blanks

Gear blanks, precision ground flat and parallel to a tolerance of .0002 per inch of diameter, are now available for the first time as a readily purchased stock item from Precision Disc Grinding Corp. Material is 24ST aluminum in sizes ranging from 1⅜ to 4⅜ diameter by ⅛" thick. The gear blanks have their quality generated by the use of double disc grinders.

Precision Disc Grinding Corp., 57 Meserole Ave., Brooklyn 22, N.Y.

Use HANDY Card, opposite page 68. Encircle No. 134

Thompson Grinder Celebrates 50th Anniversary

William G. Baldenhofer
president, gen. manager

Ralph R. Baldenhofer
exec. vice-president and treas.

John C. Wilson
vice-president, sales and engineering

The Thompson Grinder Co., Springfield, O., is currently celebrating its golden anniversary. Founded in 1905, the company was incorporated the following year and produced its first grinder, the Thompson Universal, figure 1.

The production of this small general utility grinder and jobbing work comprised the bulk of Thompson production for the next 23 years. A new type of surface grinder was designed in 1929, which was the first of the new massive-bedded, high precision grinders. The first machine was produced in 1931. With this new line of machines began the application of ideas and pioneering of developments in surface and broach grinding.

Here are a few early Thompson developments: inposition wheel trueing; hydraulic rapid traverse; high powered wheel heads to 100 hp; automatic broach sharpening; wide cross feeds; push-button wheel trueing; electric angular wheel trueing; precision anti-friction elevating screw; centralized control and silver bearing spindles and pressure lubrication.

It was during this early development that Christian Baldenhofer, founder of the company and then president, played a large part in the conception of crush grinding that was to become a famous patented Thompson grinding method. Thompson Truforming was announced in the fall of 1943 and the Thompson B and Type C Truform Grinders were used in war production, especially for high production of buckets and blades of new jet engines.

From the 23,000 feet of floor space in the 30's the company expanded until after 1954 there were 75,000 square feet of floor space; an average of 300 workers are now responsible for Thompson production.

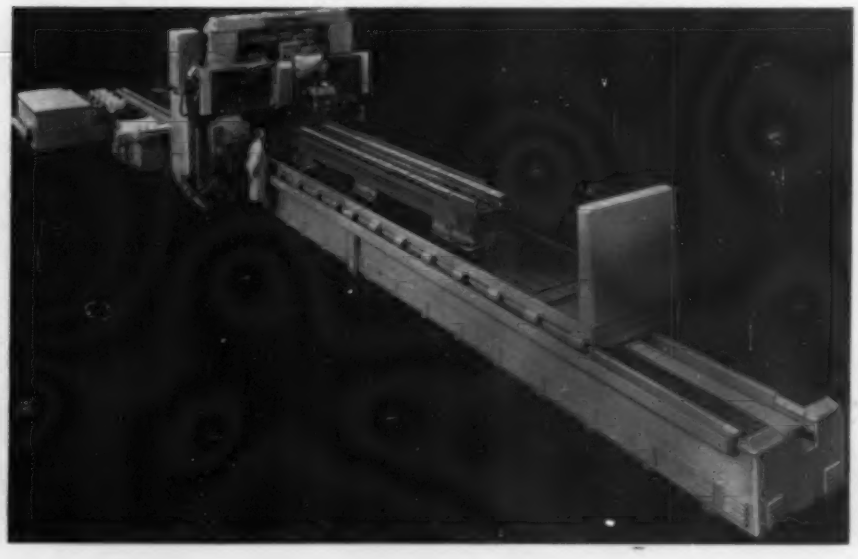
Controlled coolant through the wheel was developed by Thompson in 1946. Then followed developments such as Hydrail Grinder, making possible grinding of highly accurate and fine finishes of large machine tools. The largest surface grinder in the world, a Thompson Hydrail, was installed last year at the Monarch Machine Tool Co., figure 2.

A line of vertical spindle grinders with sliding column was developed, Hydrovert grinders, for grinding multi-level or wide flat surfaces. Dual rotary grinders were recently developed for high production of such parts as automatic transmission gears, circular saws and housing castings.

Christian Baldenhofer, who passed away in 1953, was succeeded as president by his eldest son, William G. Baldenhofer.

Ralph Baldenhofer is vice-president and treasurer; John C. Wilson, vice-president in charge of sales and engineering; Mrs. Ruth Andrews, secretary; and Fred T. Wilson, assistant secretary.

2. Hydrail way grinder, world's largest surface grinder. It is installed at the Monarch Machine Tool Co.



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Tough grinding jobs?

Check *Vulcanaire* high speed precision grinding heads!

Grinding circular slot using Vulcan's Rotary Table and Magnetic chuck.

Many seemingly impossible grinding problems have been solved by adapting Vulcanaire to standard machines or by using one of Vulcan's specially designed machines.

On Surface Grinders, merely remove wheel and guard, clamp vertical or horizontal adaptor to machine as illustrated. No belts necessary. For instance, Vulcanaire used in connection with Vulcan's Rotary Table for Surface Grinders permits the grinding of a circular slot.

Vertical adaptor for Surface Grinders. Grinding small slots

Adaptors are in stock to fit the spindle of Vertical Milling Machines for grinding contours, holes and slots.

On Internal Grinding Machines Vulcanaire's infinitely controlled speeds furnish the correct surface cutting speed resulting in faster production and micro finish. The adaptor sleeve fits into present housing.

Applied to Jig Boring Machines, Vulcanaire is liked by leading precision manufacturers because its accuracy is guaranteed, producing Vulcanaire jig grinding of large and small parts.

Horizontal application. Grinding a shoulder Punch.

Send us a blue print on your toughest grinding problem. Recommendations and sketches will be returned to you — no obligation.

Major Vulcan Services

Engineering, Processing, Designing and Building... Special Tools... Dies ... Special Machines ... Vulcamatic Transfer Machines ... Automation ... including the Vulcan Hydraulics that Form, Pierce, Assemble and size. ... Vulcanaire Jig Grinders ... Motorized Rotary Tables ... Plastic Tooling.

VULCAN TOOL CO.

710 PRITZ STREET • DAYTON 10, OHIO

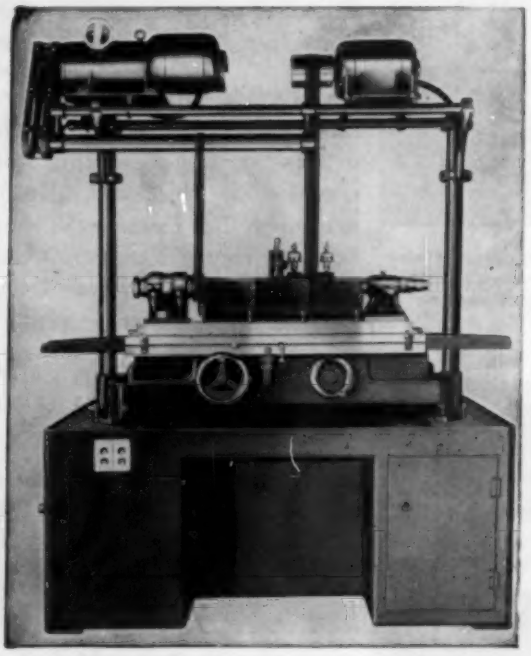
Encircle No. 231 on card opposite Page 68

WHY AN OVERHEAD DRIVE?

When purchasing a Grinder you want roundness from .000005 to .000020, a finish from One to Five R.M.S. with immediate spark-out for fast production and ability to hold size from .0001 to .000010.

In order to accomplish this CRYSTAL LAKE uses double taper cone bearings that are pulled into solid bronze boxes.

CRYSTAL LAKE introduced their One R.M.S. Grinder in 1936 featuring their separate motor drive, eliminating cine-wave and providing ample power as a motor larger than wheel head can be used. To produce a One R.M.S. a heavy oil drag has to be placed on bearings. When a spindle is round and held tight in solid boxes, sizing is easy. Spindle, if necessary, can be stopped for measuring of small work, as motor recoil is taken up by springs on hinged motor plate.



As an example of the advantages of the overhead drive, we use our No. 1018 Universal Grinder which is equipped with a 2 horse power motor mounted overhead driving the wheel head spindle ninety degrees from grinding wheel pressure which keeps the bearings round and doubles their life. A one horse power drag is placed on a 2⅛" Diameter spindle so wheel will have to cut round. Bearings can be adjusted from time to time by using Dial Indicator to set end play.

Along with the two horse power on the Wheel Spindle a ¾ h.p. Speedranger is used on the Headstock so a ½ h.p. drag can be placed on double taper headstock bearings. Headstock will grind round from .000005" up.

Table can be moved easily as several hundred pounds are taken off table by this mounting.

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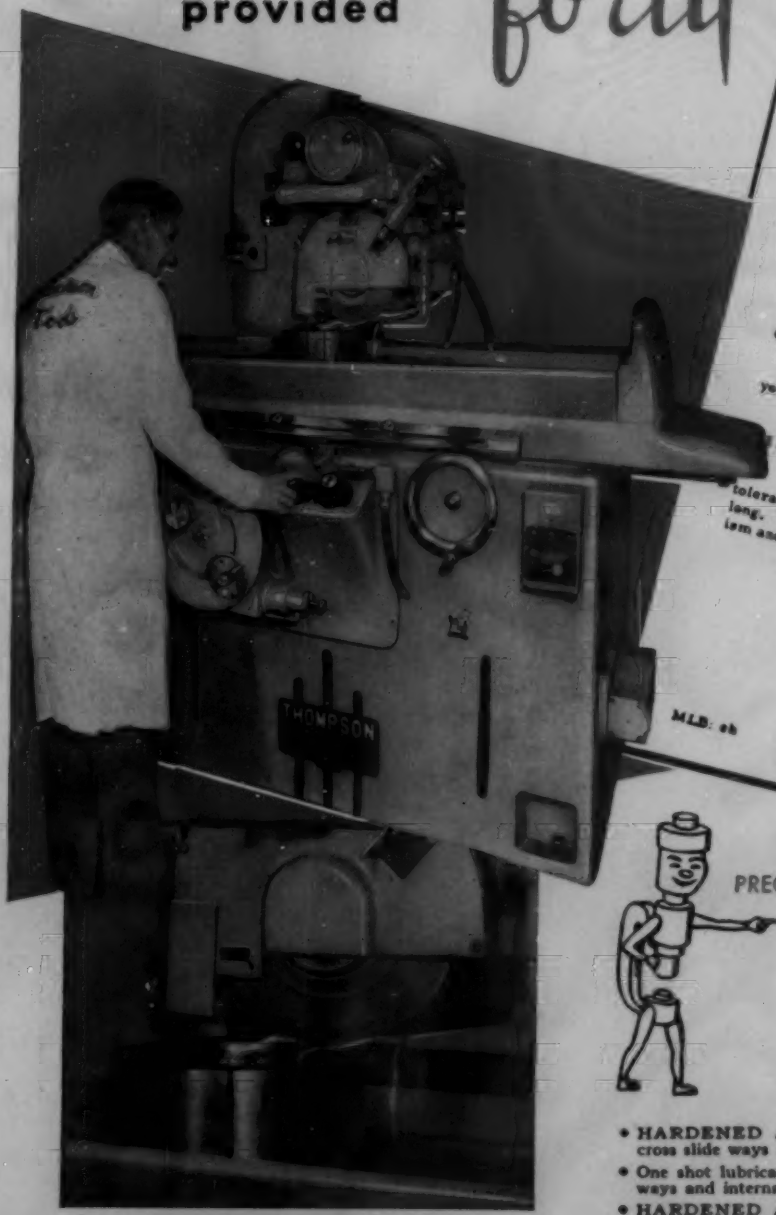

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EAST 55TH AND HAMILTON AVENUE
CLEVELAND 14, OHIO

September 17, 1954

The Thompson Grinder Company
Springfield, Ohio

Attention: Mr. John Wilson,
Vice President.

Gentlemen:

May we take this opportunity to express our satisfaction with your Thompson 2F 8 x 10 x 24 Surface Grinder.

We purchased this grinder on your claim of .0001 for parallelism size. This tolerance is necessary for most of our work.

Upon its arrival we asked a service man to prove this .0001 tolerance, using 5 blocks on a surface of 4 inches wide by 20 inches long. The test blocks showed .00004 (forty millionths) for parallelism and size. This was well within your guarantee.

Yours truly,

ERICKSON TOOL COMPANY

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